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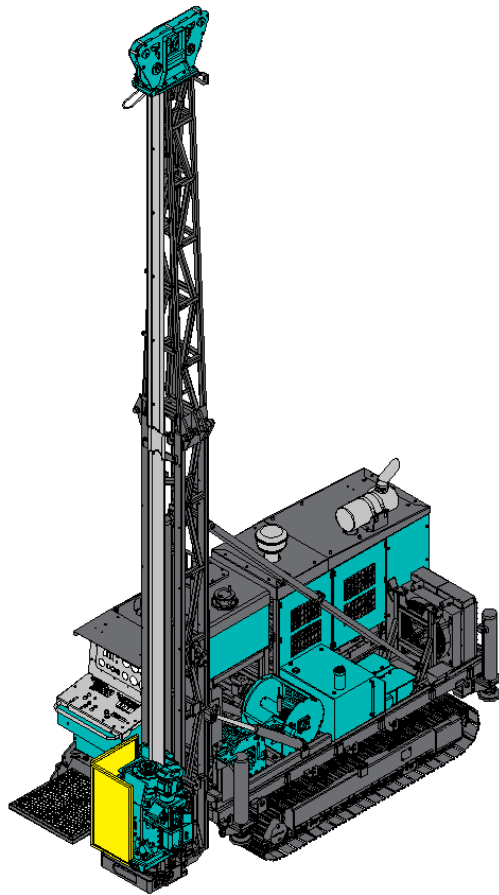
# Operation and Maintenance Manual

## EVERDIGM Core Drill Rig

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### ECR12 & ECR18

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Operation manual No. : MUR AUS.0018

Revision Date : 2016.02.27

## FOREWORD

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### IMPORTANT!

It is very important for you to read and understand this manual before operating and to keep the instructions provided herewith. Never fail to follow the instruction related to safety.

This manual contains instructions and information on safe and correct use of EVERDIGM core drill.

- Please read and understand this manual before operation, inspections and maintenance of the core drill.  
Keep this manual with your equipment all the time for your quick and easy reference, and read it regularly.
- Do not operate the equipment until you have been trained in the use of all operating controls and understand the equipment operation.
- Get a replacement manual from EVERDIGM dealer if you lost it.
- If you transfer the equipment to the other, do transfer this manual as well.
- The figures in this manual are for better understanding and may not correspond exactly to the equipment. For exact shape, refer to the parts list or ask EVERDIGM.
- For the purpose of constant product improvement, some parts of this manual may be changed. If you found the parts unclear or not corresponding to the equipment, call and consult EVERDIGM dealer or authorized service center
- Important information on safety is described in the safety information chapter of this book. Be familiarized with the instructions on the safe operation and observe the instructions before and during operation
- Injury, death or damage caused by unauthorized product modifications and operation under unallowed application will not be responsible by EVERDIGM. Consult EVERDIGM for such modifications and applications.
- Use EVERDIGM genuine parts. EVERDIGM takes no responsibility for damages caused by use of non-EVERDIGM spare parts.
- For warranty, we refer you to the warranty conditions provided separately.

We always exert all our efforts for your satisfaction, and promise you quick and constant service.

We thank you for using EVERDIGM products and wish you a good luck in every your job,

Feb. 2016

**EVERDIGM Corp.**

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\* Specifications and features presented in this document are subject to change without notice.

\* The external figures of components and machine on this manual may different according to drill rig models.

# 1. Safety Information

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## 1.1 Safety Precautions




### WARNING!

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that are in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

This manual describes the correct use of the product and basic safety instructions. Important instructions in this manual are marked with this symbol . When you see this symbol in this manual or stickers on the product, you must be alert to the possibility of personal injury or death. Be sure to observe the instruction in the safety message.

The safety messages in this manual do not describe all the possibilities that could cause personal injury, death or damage to the product. These safety messages are intended to provide basic instructions for safe operation and service.

Although this manual does not cover all the possible situations, it is the operator's responsibility to observe the safety instructions and regulations.

***Remember! Safety is up to you.***

### Applicable models

Model	Serial Number Range
ECR12	# ~
ECR18	# ~

## 1.2 To the Operator of a Everdigm Core Drill Rig



### **WARNING!**

Unsafe use of the drill rig could lead to serious injury or death. Operating procedures, maintenance and equipment practices or traveling or shipping methods that do not follow the safety guidelines on the following pages could cause serious, potentially fatal injuries or extensive damage to the machine or nearby property

Please respect the importance of taking responsibility for your own safety, and that of other people who may be affected by your actions.



### **WARNING!**

Improper operation and maintenance of this machine can be hazardous and could result in serious injury or death.

Operator and maintenance personnel should read this manual thoroughly before beginning operation or maintenance.

Keep this manual in the storage compartment to the rear of the operator's seat, and have all personnel involved in working on the machine read the manual periodically.

Some actions involved in operation and maintenance of the machine can cause a serious accident, if they are not done in a manner described in this manual.

The procedures and precautions given in this manual apply only to intended uses of the machine.

If you use your machine for any unintended uses that are not specifically prohibited, you must be sure that it is safe for any others. In no event should you or others engage in prohibited uses or actions as described in this manual.

EVERDIGM delivers machines that comply with all applicable regulations and standards of the country to which it has been shipped. If this machine has been purchased in another country or purchased from someone in another country, it may lack certain safety devices and specifications that are necessary for use in your country. If there is any question about whether your product complies with the applicable standards and regulations of your country, consult EVERDIGM or your EVERDIGM distributor before operating the machine.



### **SAFETY ALERT SYMBOL!**

Be Prepared - Get to Know All Operating and Safety Instructions.

This is the Safety Alert Symbol. Wherever it appears in this manual or on safety signs on the machine you should be alert to the potential for personal injury or accidents.

Always observe safety precautions and follow recommended procedures.







### **WARNING!**

If you need more information or have any questions or concerns about safe operating procedures or working the drill rig correctly in a particular application or in the specific conditions of your individual operating environment, please consult your local EVERDIGM representative.

### 1.3 Learn the Signal Words Used with the Safety Alert Symbol

The words “**DANGER**”, “**WARNING**”, “**CAUTION**” and “**IMPORTANT**” appeared with the above **Safety Alert Symbol** indicate degree of risk of hazards or unsafe practices. All four degrees of risk indicate that safety is involved. Observe precautions indicated whenever you see the **Safety Alert Symbol**, no matter which signal word appears next to the “Exclamation Point” symbol.

-  **DANGER!** Indicates imminent hazard of a situation that, if not avoided, is very likely to cause death or extremely serious injury. It may also be used to alert against product that may exploded or detonate if handled or treated carelessly.
-  **WARNING!** Indicates potential of a hazardous situation that, if not avoided, could result in serious injury or death. It may also be used to alert against a highly unsafe practice.
-  **CAUTION!** Indicates potential of a hazardous situation that, if not avoided, could result in minor or moderate injury. It may also be used to alert against a general unsafe practice.
-  **IMPORTANT!** Indicates potential of damages that, if not avoided, could be caused to the product or shorten the product life.

EVERDIGM cannot predict every circumstance that might involve a potential hazard in operation and maintenance. Therefore the safety messages in this manual and on the machine may not include all possible safety precautions. If any procedures or actions not specifically recommended or allowed in this manual are used, you must be sure that you and others can do such procedures and actions safely and without damaging the machine. If you are unsure about the safety of some procedures, contact a EVERDIGM distributor.

### 1.4 Lifting Capacity Rating Configuration

Lifting capacity ratings that are printed at the end of this safety section are based on the machine being level, on a firm supporting surface, with hooks and slings attached in approved configuration. Loads must be balanced and supported evenly.

Use tag lines to keep the load steady if wind conditions and large surface area are a problem. Work crew hand signals, individual tasks and safe procedures should all be universally understood before the lift is made.



#### **IMPORTANT!**

Before using the drill ring to make lifts check municipal and regional regulations or statutes that could apply.

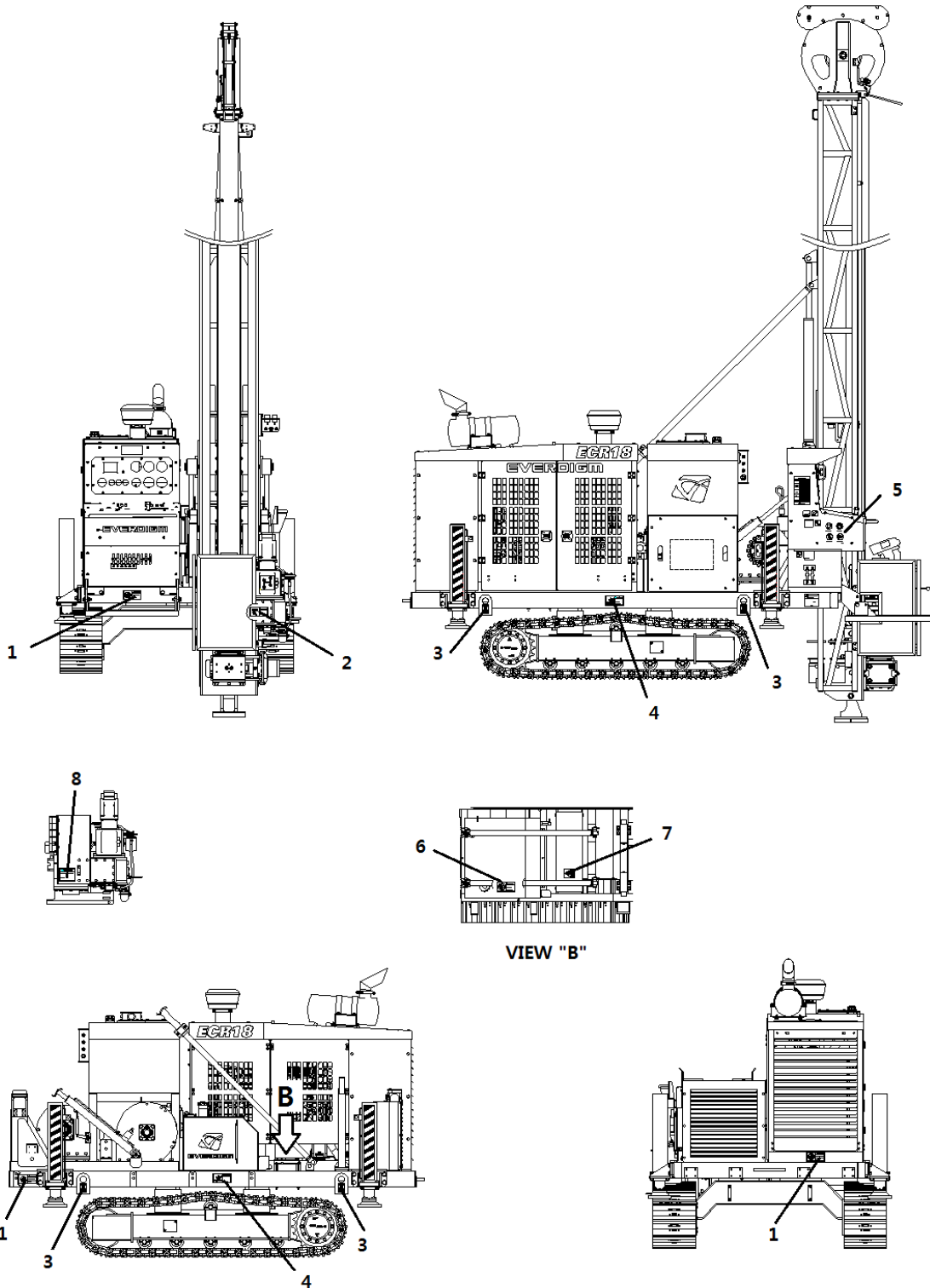
Governing ordinances may require that all heavy lifting be done with single purpose equipment specifically designed for making lifts, or other local restrictions may apply.


Making heavy lifts with a general purpose drill rig that can be used for digging, loading, grading or other work may be expressly forbidden by a regional injunction or other legal prohibition. Always follow all of the other instructions, guidelines and restrictions for Safe Lifting in the Operation and Maintenance Manuals.





## 1.5 Location of Safety Labels

Location of safety labels (decals) can vary from unit to unit. Refer to appropriate Operation and Maintenance Manual, and parts manual for your unit. Always replace damaged or faded decals.



1.  **! DANGER**  
Do not enter working range when machine in operation  
PN=D-24031910

2.  **! WARNING**  
Crush hazard.  
Do not enter working range when machine in operation  
Can cause bodily injury.  
PN=D-24031931

3.  **HOOK Crane here!**


4.  **! WARNING**  
Never ride on the track when machine in operation.  
Stop the machine on maintenance work.  
Can cause severe injury  
PN=D-24031934

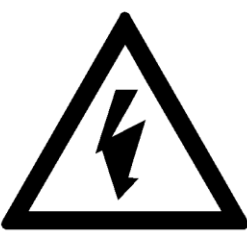
5.  **EAR PROTECTION SHALL BE WORN**

 **SAFETY HELMET SHALL BE WORN**

 **HAND PROTECTION SHALL BE WORN**

 **FOOT PROTECTION SHALL BE WORN**  
PN=RQ125-0011

6.  **! CAUTION**  
**INLET**  
Use only diesel fuel.  
Stop the engine on fueling.  
Be Careful with the fire.  
PN=D-24031911

7.  **BATTERY**  
PN=D-24031910

8. **! CAUTION**  
Do not operate rotation unit without holding pipe with chuck.  
If rotation unit is operated without pipe, it will cause internal parts damages in rotation unit.  
PN=RQ125-0030

## **1.6 Unauthorized Modification**

Any modification made without authorization or written approval from EVERDIGM can create a safety hazard, for which the machine owner must be held responsible.

For safety's sake, replace all OEM parts with the correct authorized or genuine EVERDIGM part. For example, not taking the time to replace fasteners, bolts or nuts with the correct replacement parts could lead to a condition in which the safety of critical assemblies is dangerously compromised.

## **1.7 General Hazard Information**

### **Safety Rules**

Only trained and authorized personnel can operate and maintain the machine.

Follow all safety rules, precautions and instructions when operating or performing maintenance on the machine.

Do not operate the machine if you are not feeling well, if you are taking medication that makes you feel sleepy, if you have been drinking, or if you are suffering from emotional problems. These problems will interfere with your sense of judgment in emergencies and may cause accidents.

When working with another operator or with a person on work site traffic duty, be sure that all personnel know the nature of the work and understand all hand signals that are to be used.

Always observe strictly any other rules related to safety.

### **Safety Features**

Be sure that all guards and covers are installed in their proper position. Have guards and covers repaired immediately if damaged.

Be sure that you understand the method of use of safety features such as safety lock lever and the seat belt, and use them properly.

Never remove any safety features. Always keep them in good operating condition.

Failure to use safety features according to the instructions in the Operation and Maintenance Manual could result in serious bodily injury.

## **1.8 Operator's control area or operator cabin (option)**

When entering the operator's control area, always remove all mud and oil from the soles of your shoes. If you operate levers with mud or oil stuck to your hands or gloves, your hand may slip and this may cause a serious accident.

Smoking while operating may cause fire around machine and working area. Make sure that the cigarette should be extinguished completely after smoking.

Do not stick suction pads to the window glass. Suction pads act as a lens and may cause fire.

Do not leave lighters laying around the operator's compartment. If the temperature inside the operator's compartment becomes high, there is danger that the lighter may explode.

Do not use cellular telephones when driving or operating the machine. There is danger that this may lead to an unexpected accident.

Never bring any dangerous objects such as flammable or explosive items into the operator's control area.

To ensure safety, do not use the radio or music headphones when operating the machine. There is danger that this may lead to a serious accident.

When operating the machine, do not put your hands around rotation unit.

When standing up from the operator's seat, always pay special attention not to touch operation levers and switches. If you accidentally touch the work equipment levers, the machine may suddenly move and cause serious injury or damage.

When leaving the machine, lower and firmly fix the work equipment completely to the ground, and shut down engine. Use the key to lock all the equipment. Always remove the key and take it with you.

## 1.9 Basic Safety Information



### WARNING!

The following instructions are those that should **ALWAYS** be observed in operation of drill rig.

### Preparation for Operation and Maintenance

The operators and servicemen should read the manual and instruction and obey the rules. Neglecting safety instruction can cause death or serious injury. The carrier, hydraulic and electric requirements should be matched with manufacturer's recommendation as described in the manual.

Improper modification can cause damage on the equipments.

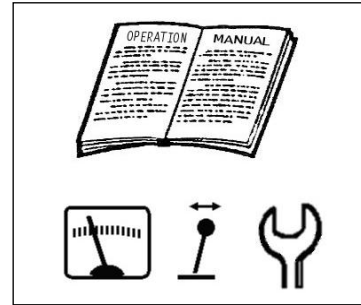


Figure 1

Contain long hair, and avoid loose clothing and jewelry. They can catch on controls or in protruding parts and cause serious injury or death. Do not wear oily clothes. They are highly flammable. Full eye protection, a hard hat, safety shoes and gloves may be required at the work site.

While working on the machine, never use inadequate tools. They could break or slip, causing injury, or they may not adequately perform intended functions.



Figure 2

### Breathing Masks, Ear Protection May Be Required

Do not forget that some risks to your health may not be immediately apparent. Exhaust gases and noise pollution may not be visible, but these hazards can cause disabling or permanent injuries.

**NOTE:** The equivalent continuous A-weighted sound pressure level at the workstation for this machine is given in the operation manual.

Measurement is obtained on a dynamic machine following the procedures and cabin conditions as described in ISO 6396.

**NOTE:** The guaranteed sound power level emitted by the machinery for this machine is given in the operation manual.

Measurement is obtained on a dynamic machine with the procedures as described in 2000/14/EC.

## Vibration Level Information

Hands/Arms: The weighted root mean square acceleration to which the hands/arms are subjected, is less than 2.5 m/s<sup>2</sup>.

Whole body: The weighted root mean square acceleration to which the whole body is subjected, is less than 0.5 m/s<sup>2</sup>.

Measurements are obtained on a representative machine, using measuring procedures as described in the following standard: ISO 2631/1, ISO 5349, and SAE J1166.

## Recommendations for Limiting Vibrations

1. Select the right machine for a particular application.
2. Replace any damaged seat by a genuine EVERDIGM part. Keep the seat maintained and adjusted.
  - Adjust the seat and suspension for the weight and size of the operator.
  - Inspect and maintain the suspension and adjustment mechanisms of the seat regularly.
3. Check that the machine is properly maintained.
  - Track tension, actuators conditions and etc.
4. Supply grease on moving parts.
5. Adjust the machine speed and travel path to reduce the vibration level.
  - Slow down if it is necessary when passing rough terrain.
  - Drive around obstacles and excessive rough terrain conditions.
6. Keep the terrain on work sites where the machine is working and traveling in good condition.
  - Remove any large rocks or obstacles.
  - Fill any ditches and holes.
  - Provide machines for and schedule time to maintain the terrain conditions.
7. Travel over longer distance (e.g. on public roads) at adjusted (medium) speed.
  - Always adjust the speed for preventing bouncing.

## Mounting and Dismounting

Before getting on or off the machine, if there is any oil, grease, or mud on the handrails, steps, or track shoes, wipe it off immediately. Always keep these parts clean. Repair any damage and tighten any loose bolts.

Never jump on or off the machine. In particular, never get on or off a moving machine. These actions may lead to serious injury.

When getting on or off the machine, always face the machine, and maintain three-point contact (both feet and one hand or one foot and both hands) with the handrails, steps, and track shoes to ensure that you support yourself securely.

Never hold any control levers when getting on or off the machine.

Use the points marked by arrows in the diagram when getting on or off the machine.

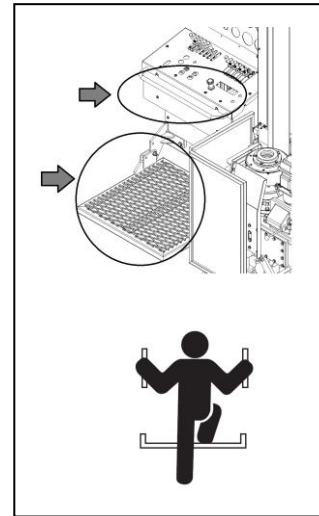


Figure 3

## Fuel, Oil and Hydraulic Fluid Fire Hazards

Fuel, oil and antifreeze will catch fire if it is brought close to a flame. Fuel is particularly flammable and can be hazardous.

Always strictly observe the following.

Add fuel, oil, antifreeze and hydraulic fluid to the machine only in a well ventilated area. The machine must be parked with controls, lights and switches turned "OFF." The engine must be "OFF" and any flames, glowing embers, auxiliary heating units or spark causing equipment must be doused, turned "OFF" and/or kept well clear of the machine.

Static electricity can produce dangerous sparks at the fuel filling nozzle. In very cold, dry weather or other conditions that could produce a static discharge, keep the tip of the fuel nozzle in constant contact with the neck of the fuel filling nozzle, to provide a ground.

Keep fuel and other fluid reservoir caps tight and do not start the engine until caps have been secured.



Figure 4

## Precautions When Handling Fluids at High Temperature

Immediately after operations are stopped, the coolant, engine oil, and hydraulic oil are at high temperature and the radiator and hydraulic tank are still under pressure. Attempting to remove the cap, drain the oil or coolant, or replace the filters may lead to serious burns. Always wait for the temperature to go down, and follow the specified procedures when carrying out these operations.

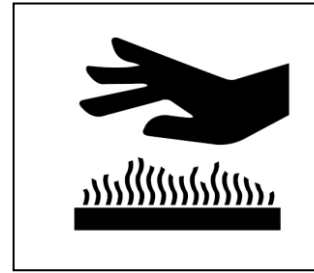


Figure 5

To prevent hot coolant from spurting out, shut down engine, wait for the coolant to cool, then loosen the cap slowly to relieve the pressure.

To prevent hot oil from spurting out, shut down engine, wait for the oil to cool, then loosen the cap slowly to relieve the pressure.

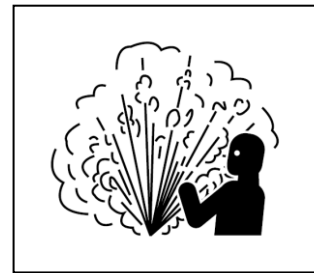


Figure 6

## Asbestos Dust Hazard Prevention

Asbestos dust can be HAZARDOUS to your health if it is inhaled. Materials containing asbestos fiber can be present on work site. Breathing air that contains asbestos fiber can ultimately cause serious or fatal lung damage. To prevent lung damage from asbestos fiber, observe following precautions:

- Use a respirator that is approved for use in an asbestos-laden atmosphere.
- Never use compressed air for cleaning.
- Use water for cleaning to keep down the dust.
- Work on the machine or component with the wind at your back whenever possible.
- Always observe any rules and regulations related to the work site and working environment.

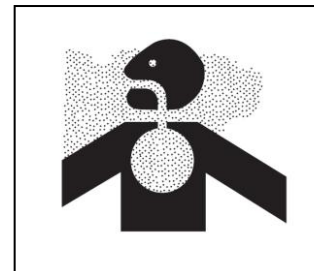


Figure 7



## Injury from Work Equipment

Do not enter or put your hand, arm or any other part of your body between movable parts, such as between the work equipment and cylinders, or between the machine and work equipment.

If the control levers are operated, the clearance between the machine and the work equipment will change and this may lead to serious damage or personal injury.

If going between movable parts is necessary, always position and secure the work equipment so that it cannot move.



Figure 8

## Fire Extinguisher and First Aid Kit

As a precaution if any injury or fire should occur, always do the following.

- Be sure that fire extinguishers have been provided and read the labels to ensure that you know how to use them. It is recommended that an appropriately sized multipurpose "A/B/C" fire extinguisher be mounted in the cabin. Check and service the fire extinguisher at regular intervals and make sure that all work site crew members are adequately trained in its use.
- Provide a first aid kit in the storage compartment and keep another at the work site. Check the kit periodically and make any additions if necessary.
- Know what to do in case of injury from fire.
- Keep emergency numbers for doctor, ambulance service, hospital and fire department near your telephone.

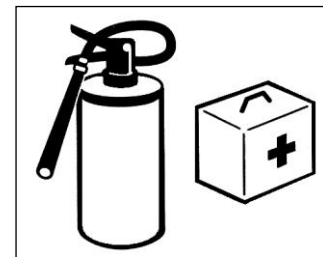


Figure 9

If the machine catches fire, it may lead to serious personal injury or death. If a fire occurs during operation, escape from the machine as follows:

- Turn the starter switch to the "O" (OFF) position and shut down engine.
- If there is time, use the fire extinguisher to extinguish as much of the fire as possible.
- Use the handrails and steps to escape from the machine.

The above is the basic method for escaping from the machine, but changing the method may be necessary according to the conditions, so carry out practice skills at the work site.

## Protection from Falling or Flying Objects

On work sites where there is danger that falling objects or flying objects may hit the operator, select a guard to match the operating conditions to protect the operator.

Working in mines, tunnels, deep pits or on loose or wet surfaces could produce danger of falling rock or hazardous flying objects. Additional protection for the operator safety could be required.

Never attempt to alter or modify any type of protective structure reinforcement system, by drilling holes, welding, remounting or relocating fasteners. Any serious impact or damage to the system requires a complete integrity reevaluation. Reinstallation, recertification and/or replacement of the system may be necessary.

Contact your EVERDIGM distributor for available safety guards and/or recommendations if there is any danger of getting hit by objects that could strike the operator's cabin. Make sure that all other work site crew members are kept well away from the drill rig and safe from possible hazards.

When working in mines or quarries where there is danger of falling rock, install FOPS (Falling Objects Protective Structure) and apply a laminated coating sheet to the front glass.

If any glass on the machine is broken, replace it with new glass immediately.



Figure 10

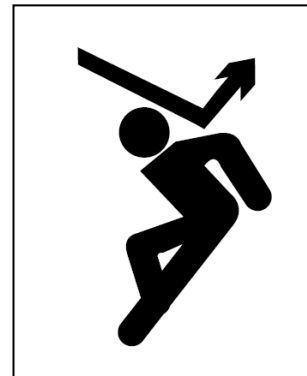


Figure 11

## Accumulator

The pilot control system is equipped with an accumulator. For a brief period of time after the engine has been shut down, the accumulator will store a pressure charge that may enable hydraulic controls to be activated. Activation of any controls may enable the selected function to operate under force of gravity.

When performing maintenance on the pilot control system, the hydraulic pressure in the system must be released as describe in "Handling of Accumulator" in the Operation and Maintenance Manual.

The accumulator is charged with high-pressure nitrogen gas, so it is extremely dangerous if it is handled in the wrong way. Always observe the following precautions:

- Do not drill or make any holes in the accumulator or expose it any flame, fire or heat source.
- Do not weld on the accumulator, or try attaching anything to it.
- When carrying out disassembly or maintenance of the accumulator, or when disposing of the accumulator, the charged gas must be properly released. Contact your EVERDIGM distributor.
- Wear safety goggles and protective gloves when working on an accumulator. Hydraulic oil under pressure can penetrate the skin and cause serious injuries

## Ventilation on closed area

Engine exhaust gases can cause fatal accidents, and unconsciousness, loss of alertness, judgment and motor control and serious injury.

Make sure there is adequate ventilation before starting the engine in any enclosed area.

You should also be aware of open windows, doors or ductwork into which exhaust may be carried, or blown by the wind, exposing others to danger.

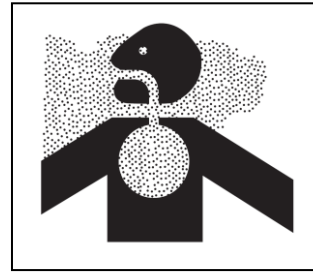


Figure 12



### **WARNING!**

Protect your eyes when breaking the glass.

## 1.10 Before Starting Engine Safety

### Work Site Precautions

Before starting operations, thoroughly check the area for any unusual conditions that could be dangerous.

Check the terrain and condition of the ground at the work site, and determine the best and safest method of operation.

Make the ground surface as hard and horizontal as possible before carrying out operations. If there is a lot of dust and sand on the work site, spray water before starting operations.

If you need to operate on a street, protect pedestrians and cars by designating a person for work site traffic duty or by erecting fences and posting "No Entry" signs around the work site.

Erect fences, post "No Entry" signs, and take other steps to prevent people from coming close to or entering the work site. If people come close to a moving machine, they may be hit or caught by the machine, and this may lead to serious personal injury or death.

Water lines, gas lines, phone lines and high voltage electrical lines may be buried under the work site. Contact each utility and identify their locations. Be careful not to damage or cut any of these lines.

Any type of object in the vicinity of the boom could represent a potential hazard, or cause the operator to react suddenly and cause an accident. Use a spotter or signal person working near bridges, phone lines, work site scaffolds, or other obstructions.

Minimum levels of insurance coverage, work permits or certification, physical barriers around the work site or restricted hours of operation may be mandated by governing authorities. There may also be regulations, guidelines, standards or restrictions on equipment that may have to be followed for local requirements. There may also be regulations related to performing certain kinds of work. If there is any question about whether your machine and work site complies with the applicable standards and regulations contact your local authorities and agencies.

Avoid entering soft ground. It will be difficult for the machine to escape.

Avoid operating your machine too close to the edge of cliffs, overhangs, and deep ditches. The ground may be weak in such areas. If the ground should collapse, the machine could fall or tip over and this could result in serious injury or death.

Remember that the soil after heavy rain, blasting or after earthquakes, is weakened in these areas.

Earth laid on the ground and the soil near ditches is loose. It can collapse under the weight of vibration of your machine and cause your machine to tip over.

Install the special guards if working in areas where there is danger of falling rocks.

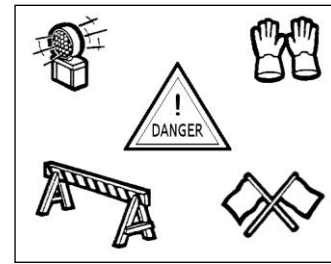


Figure 13

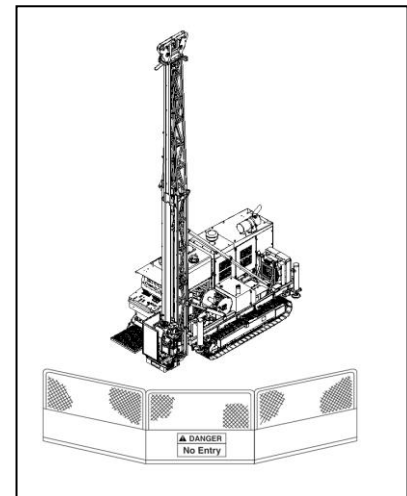


Figure 14

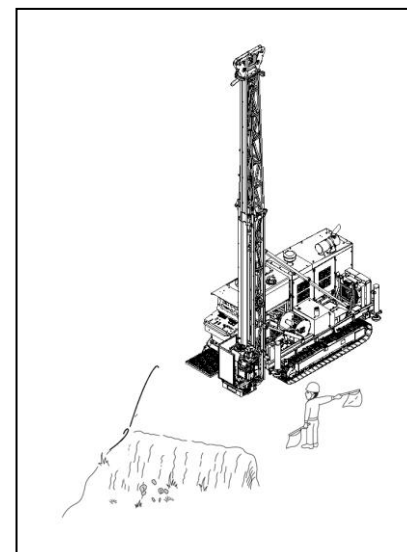


Figure 15

## Checks Before Starting Engine

Every day before starting the engine for the first time, carry out the following checks. If these checks are not carried out properly, there is danger of serious injury.

Completely remove all wood chips, leaves, grass, paper and other flammable materials accumulated in the engine compartment and around the battery. They could cause a fire. Remove any dirt from the window glass, mirrors, handrails, and steps.

Do not leave tools or spare parts laying around in the operator's compartment. The vibration of the machine when traveling or during operations may cause them to fall and damage or break the control levers or switches. They may also get caught in the gap of the control levers and cause the work equipment to malfunction or move dangerously. This may lead to unexpected accidents.

Check the coolant level, fuel level, lubrication oil level and hydraulic tank oil level, and check for clogged air cleaner and damage to the electrical wiring.

Check the step condition where operator will stand and it is easy to operate the machine.

Check the operation of the gauges, operation levers and switches.

If any abnormalities are found in the above checks, carry out repairs immediately

## Engine Starting

Walk around your machine before getting in the operating area. Look for evidence of leaking fluid, loose fasteners, misaligned assemblies or any other indications of possible equipment hazard.

All equipment covers and machinery safety guards must be in place, to protect against injury while the machine is being operated.

Look around the work site area for potential hazards, people or property that could be at risk while operation is in progress.

NEVER start the engine if there is any indication that maintenance or service work is in progress, or if a warning tag is attached to controls in the cabin.

A machine that has not been used recently, or is being operated in extremely cold temperatures, could require a warm-up or maintenance service before start-up.

Check gauges and monitor displays for normal operation before starting the engine. Listen for unusual noises and remain alert for other potentially hazardous conditions at the start of the work cycle.

Do not short circuit the starting motor to start the engine. This is not only dangerous, but may also damage the machine.

When starting the engine, sound the horn as an alert.

Start and operate the machine only while all danger factors are cleared.

## Before Operating Machine

If checks are not carried out properly after starting the engine, it may result in a delay in discovering abnormalities in the machine, and this may lead to personal injury or damage to the machine.

Carry out the checks in an open area where there are no obstructions. Do not let anyone near the machine when carrying out the checks.

- Check the operating condition of the equipment, and the actuation of mast control, travel, and rotation head working conditions.
- Check the machine for any abnormal noise, vibration, heat, smell, or abnormality with the gauges. Check also for leakage of air, oil, and fuel.
- If any abnormality is found, repair the problem immediately. If the machine is used without repairing the problems, it may lead to unexpected injury or failure.
- Clear all personnel from directly around machine and from the area.
- Clear all obstacles from the machine's path. Beware of hazards.
- Make sure that the horn, the travel alarm (if equipped), and all other warning devices are working properly.
- Warm up the engine and hydraulic oil before operating machine.
- Before moving the machine, check the position of undercarriage. The normal travel position is with idler wheels to the front under the cabin and the drive sprockets to the rear. When the undercarriage is in the reversed position, the travel controls must be operated in opposite directions.

## 1.11 Machine Operation Safety

### When Changing Direction of Travel

Before operating the machine or the work equipment, always observe the following precautions to prevent serious injury or death.

- Start and operate the machine only while seated.
- When changing the direction of travel from forward to reverse or from reverse to forward, reduce speed early and stop the machine before changing the direction of travel.
- Sound the horn to warn people in the area.
- Check that there is no one in the area around the machine. There are blind spots behind the machine, so if necessary, check all blind spots that there is no one behind the machine before traveling in reverse.
- When operating in areas that may be hazardous or have poor visibility, designate a person to direct work site traffic.
- Ensure that no unauthorized person can come within the turning radius or direction of travel.

Be sure to observe the above precautions even if a travel alarm or mirrors are installed.

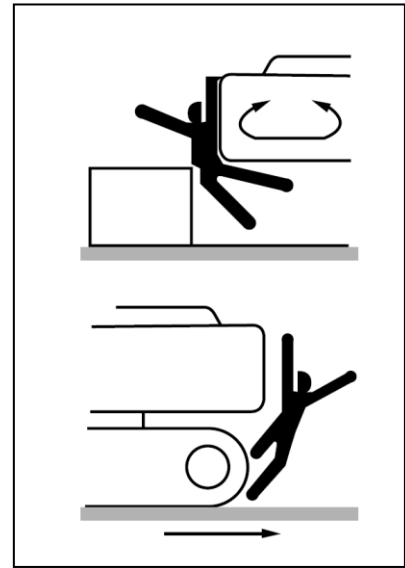


Figure 16

### Travel Precautions

Never turn the starting switch to the "O" (OFF) position when traveling. It is dangerous if the engine stops when the machine is traveling. It will be impossible to operate the steering.

Place mast on the bonnet firmly not to move mast freely by vibration during traveling.

Never travel over obstacles or slopes that will cause the machine to tilt severely. Travel around any slope or obstacle that causes the machine to tilt 10 degrees or more to the right or left, or 14 degrees or more from front to rear.

Do not turn machine suddenly. The work equipment may hit the ground and cause the machine to lose its balance, and this may damage the machine or structures in the area.

When traveling on rough ground, travel at low speed, and avoid sudden changes in direction.

Always keep to the permissible water depth. Permissible water depth is to the center line of the upper track rollers.

When traveling over bridges or structures on private land, check first that the bridge or structure can withstand the weight of the machine. When traveling on public roads, check with the local authorities and follow their instructions.

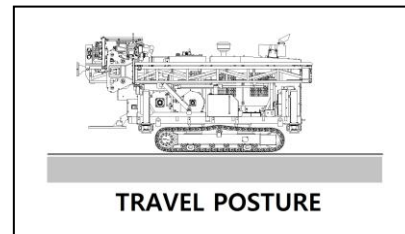


Figure 17

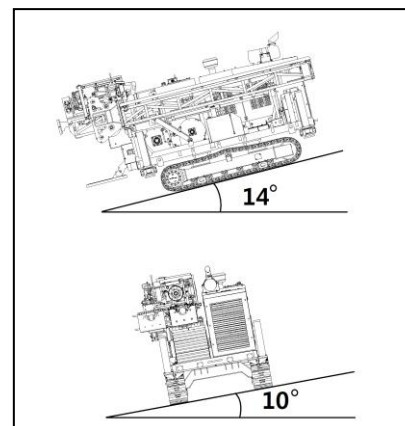


Figure 18

## **When Changing Direction of Travel**

Never jump onto a machine that is running away to stop it. There is danger of serious injury.

Traveling on slopes could result in the machine tipping over or slipping.

On hills, banks or slopes, try to balance machine with mast weight and operation.

Do not travel on grass, fallen leaves, or wet steel plates. Even slight slopes may cause the machine to slip to the side, so travel at low speed and make sure that the machine is always traveling directly up or down the slope.

Avoid changing the direction of travel on a slope. This could result in tipping or side slipping of the machine.

When possible, operate the machine up slopes and down slopes. Avoid operating the machine across the slope, when possible.



## Dangers during Operation

Do not drill the work face under an overhang. This may cause the overhang to collapse and fall on top of the machine.

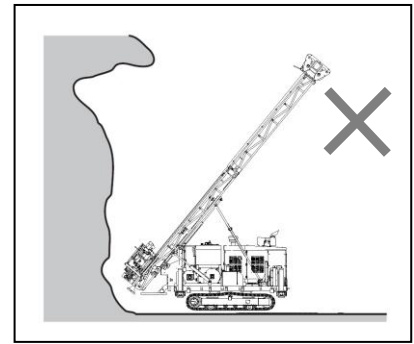


Figure 19

Do not place machine on the edge of rock. The ground under the machine may collapse and cause the machine to fall.

Never rely on lift jacks or other inadequate supports when work is being done. Block tracks fore and aft to prevent any movement.

When working at the edge of a cliff or on a road shoulder, the machine could tip over, possibly resulting in serious injury or death. Investigate the configuration and ground conditions of the work site beforehand to prevent the machine from falling and to prevent the ground, stockpiles, or banks from collapsing.

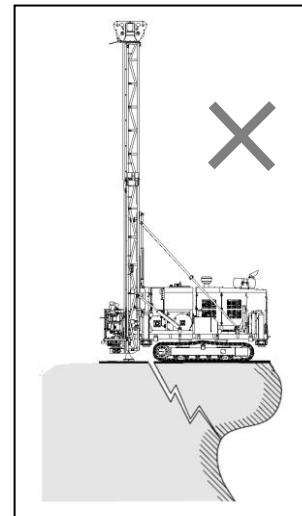


Figure 20

## Precautions for Operation

Be careful not to go close to the edge of a cliff by mistake.

Use the machine only for its main purpose. Using it for other purposes will cause failures.

To ensure an ample view, do as follows:

- When working in dark areas, attach working lights and front lights to the machine. If necessary, set up lighting at the work site.
- Stop operations when the visibility is poor, such as in fog, mist, snow, and rain. Wait for the visibility to improve to a level which causes no problems for the operation.

To avoid hitting the work equipment, always do the following:

- When working in tunnels, on bridges, under electric wires, or when parking the machine or carrying out other operations in places with limited height, be extremely careful not to hit the mast or other parts.
- To prevent collisions, operate the machine at a safe speed when working in confined spaces, indoors, or in crowded areas.
- Do not pass the mast over the heads of workers or over the operator's compartment of other machines

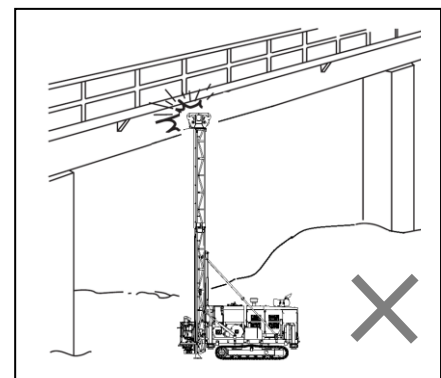


Figure 21

## Avoid High Voltage Cables

Serious injury or death can result from contact or proximity to high voltage electric lines. The mast does not have to make physical contact with power lines for current to be transmitted.

Use a spotter and hand signals to stay away from power lines not clearly visible to the operator.

Voltage	Minimum Safe Distance
6.6 kV	3 m (9' 10")
33.0 kV	4 m (13' 1")
66.0 kV	5 m (16' 5")
154.0 kV	8 m (26' 3")
275.0 kV	10 m (32' 10")

Use these minimum distances as a guideline only. Depending upon the voltage in the line and atmospheric conditions, strong current shocks can occur with the boom or mast as far away as 4 - 6 m (13 - 20 ft.) from the power line. Very high voltage and rainy weather could further decrease that safety margin.

**NOTE :** Before starting any type of operation near power lines (either above ground or buried cable type), you should always contact the power utility directly and work out a safety plan with them.

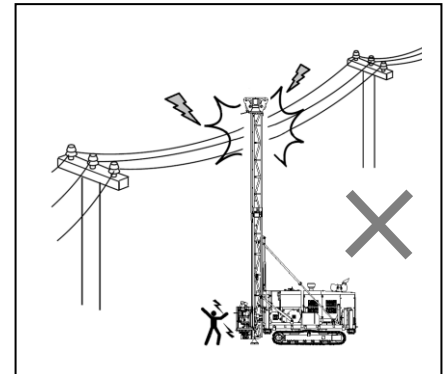


Figure 22

## Parking Machine

In a work site where falling objects or flying objects are expected, be sure to move machine on the safe place.

In a work site where falling rocks can cause damage and possibly crush personnel, or in a mining operation, be sure to avoid to danger situation.

Be sure to put any other additional protective structures required for work site conditions.

## Operation on Slopes

When working on slopes, there is danger that the machine may lose its balance and turn over, when swinging, or when work equipment is operated. Always carry out these operations carefully.

Do not turn equipment from the uphill side to the downhill side suddenly. This operation is dangerous.

If the machine has to be used on a slope, pile the soil to make a platform that will keep the machine as horizontal as possible.

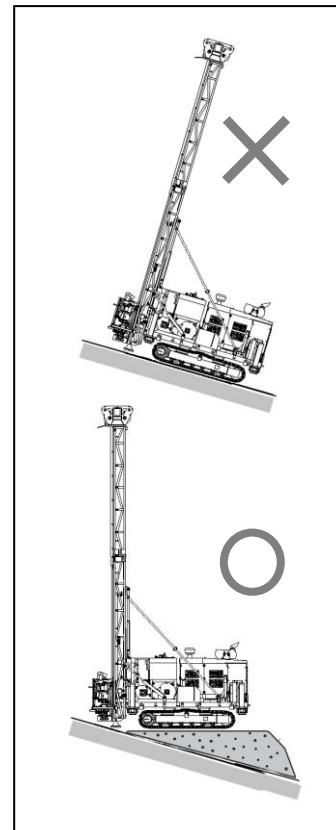


Figure 23

## Parking Machine

Avoid making sudden stops, or parking the machine wherever it happens to be at the end of the work day. Plan ahead so that the drill rig will be on firm, level ground away from traffic and away from high walls, cliff edges and any area of potential water accumulation or runoff.

There should be no possibility of unintended or accidental movement.

When parking on public roads, provide fences, signs, flags, or lights, and put up any other necessary signs to ensure that passing traffic can see the machine clearly, and park the machine so that the machine, flags, and fences do not obstruct traffic.

After retracting the extended boom, putting mast on the firm ground to an overnight storage position and all switches and operating controls are in the "OFF" position, the starter key should be removed from the machine.

Always close the door of the operator's compartment.

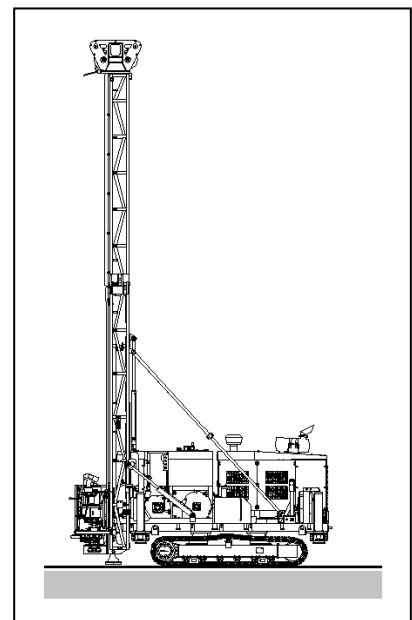


Figure 24

## 1.12 Maintenance Safety

### Warning Tag

Alert others that service or maintenance is being performed and tag operator's cabin controls – and other machine areas if required – with a warning notice.

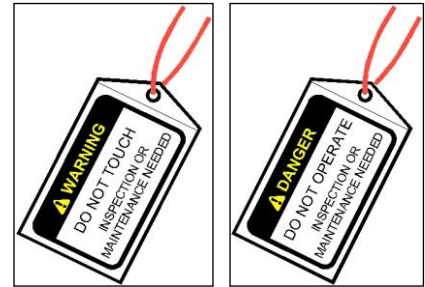


Figure 25

### Clean Before Inspection or Maintenance

Clean the machine before carrying out inspection and maintenance. This prevents dirt from getting into the machine and also ensures safety during maintenance.

If inspection and maintenance are carried out when the machine is dirty, it will become more difficult to locate the problems, and also there is danger that you may get dirt or mud in your eyes or that you may slip and injure yourself.

When washing the machine, do the following:

- Wear shoes with nonslip soles to prevent yourself from slipping and falling on wet places.
- Wear safety glasses and protective clothing when washing the machine with high-pressure steam.
- Take action to prevent touching high-pressure water and cutting your skin or having mud fly into your eyes.
- Do not spray water directly on electrical components (sensors, connector). If water gets into the electrical system, there is danger that it will cause defective operation and malfunction.

Pick up any tools or hammers that are laying in the work place, wipe up any grease or oil or any other slippery substances, and clean the area to make it possible to carry out the operation in safety. If the work place is left untidy, you may trip or slip and suffer injury.

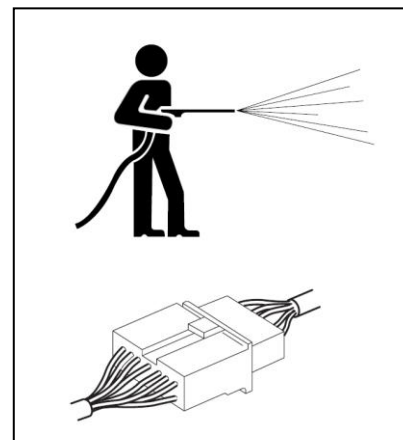


Figure 26

## Proper Tools

Use only tools suited to the task. Using damaged, low quality, faulty, or makeshift tools could cause personal injury. There is danger that pieces from, chisels with crushed heads, or hammers, may get into your eyes and cause blindness.

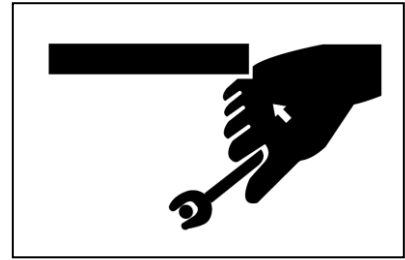


Figure 27

## Use of Lighting

When checking fuel, oil, battery electrolyte, or window washing fluid, always use lighting with antiexplosion specifications. If such lighting equipment is not used, there is danger of an explosion.

If work is carried out in dark places without using lighting, it may lead to injury, so always use proper lighting.

Even if the place is dark, never use a lighter or flame instead of lighting. There is danger of fire. There is also danger that the battery gas may catch fire and cause an explosion.

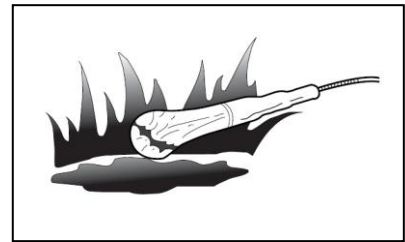


Figure 28

## Fire Prevention and Explosion Prevention

All fuels, most lubricants and some coolant mixtures are flammable. Leaking fuel or fuel that is spilled onto hot surfaces or onto electrical components can cause a fire.

Store all fuels and all lubricants in properly marked containers and away from all unauthorized persons.

Store oily rags and other flammable material in a protective container.

Do not smoke while you refuel the machine or while you are in a refueling area.

Do not smoke in battery charging areas or in areas that contain flammable material.

Clean all electrical connections and tighten all electrical connections. Check the electrical wires daily for wires that are loose or frayed. Tighten all loose electrical wires before you operate the machine. Repair all frayed electrical wires before you operate the machine.

Remove all flammable materials before they accumulate on the machine.

Do not weld on pipes or on tubes that contain flammable fluids.

Do not flame cut on pipes or on tubes that contain flammable fluids. Before you weld on pipes or on tubes or before you flame cut on pipes or on tubes, clean the pipes or tubes thoroughly with a nonflammable solvent.



Figure 29

## Burn Prevention

When checking the radiator coolant level, shut down engine, let the engine and radiator cool down, then check the coolant recovery tank. If the coolant level in the coolant recovery tank is near the upper limit, there is enough coolant in the radiator.

Loosen the radiator cap gradually to release the internal pressure before removing the radiator cap.

If the coolant level in the coolant recovery tank is below the lower limit, add coolant.

Cooling system conditioner contains alkali. Alkali can cause personal injury. Do not allow alkali to contact the skin, the eyes, or the mouth.

Allow cooling system components to cool before you drain the cooling system.

Hot oil and hot components can cause personal injury. Do not allow hot oil or hot components to contact the skin.

Remove the hydraulic tank filter plug only after the engine has been stopped. Make sure that the hydraulic tank filter plug is cool before you remove it with your bare hand. Remove the hydraulic tank filter plug slowly to relieve pressure.

Relieve all pressure in the hydraulic oil system, in the fuel system, or in the cooling system before you disconnect any lines, fittings, or related items.

Batteries give off flammable fumes that can explode.

Do not smoke while you are checking the battery electrolyte levels.

Electrolyte is an acid. Electrolyte can cause personal injury. Do not allow electrolyte to contact the skin or the eyes.

Always wear protective glasses when you work on batteries.

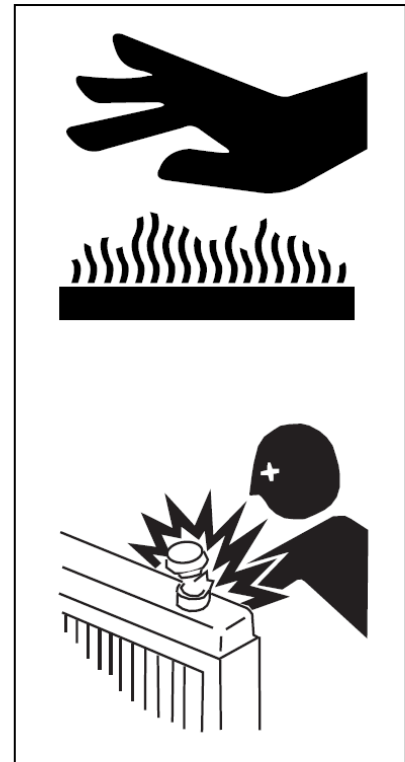


Figure 30

## Welding Repairs



### WARNING!

When you connect or disconnect connectors between ECU and Engine or connector between ECU and the machine, always disconnect the source power to protect damage of the ECU.

If you don't observe this procedure, the ECU would be damaged or the engine would operate abnormally.

When carrying out welding repairs, carry out the welding in a properly equipped place. The welding should be performed by a qualified worker. During welding operations, there is the danger of, generation of gas, fire, or electric shock, so never let an unqualified worker do welding.

The qualified welder must do the following:

- To prevent explosion of the battery, disconnect the battery terminals and remove batteries.
- To prevent generation of gas, remove the paint from the location of the weld.
- If hydraulic equipment, piping or places close to them are heated, a flammable gas or mist will be generated and there is danger of it catching fire. To avoid this, never subject these places to heat.
- Do not weld on pipes or on tubes that contain flammable fluids. Do not flame cut on pipes or on tubes that contain flammable fluids. Before you weld on pipes or on tubes or before you flame cut on pipes or on tubes, clean the pipes or tubes thoroughly with a nonflammable solvent.
- If heat is applied directly to rubber hoses or piping under pressure, they may suddenly break so cover them with a fireproof covering.
- Wear protective clothing.
- Make sure there is good ventilation.
- Remove all flammable objects and provide a fire extinguisher.

Figure 11

## Treatment for Electrical Welding to the Body Structure

To prevent damage to electrical components by electrical welding, please observe the following procedures:

1. Turn off the master switch
2. Open the door of the battery cover.
3. Detach the cover after loosening the bolts on the battery.
4. Detach the positive and negative terminal cables from the battery.
5. Proceed with welding.
6. After welding, carefully reassemble the connector.
7. Connect the battery terminal cables.
8. Reassemble the cover over the battery.
10. Turn on the master switch.

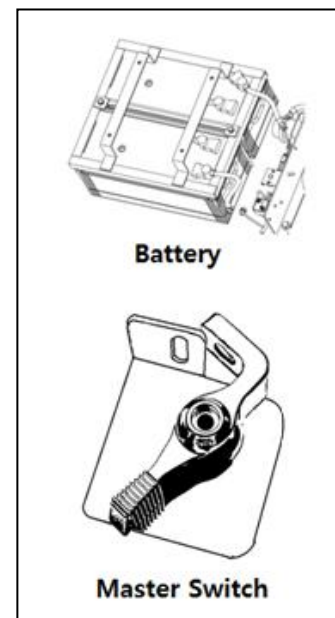


Figure 31

## Precautions for Removal, Installation of Heavy Components

Before starting removal and installation of heavy components, decide the team leader.

Do not allow anyone except the authorized workers close to the machine.

Place components that have been removed from the machine in a safe place so that they do not fall. Put up a fence around the components and take other measures to prevent unauthorized persons from entering.



Figure 32

## Precautions When Working on Machine

When carrying out maintenance operations on the machine, keep the area around your feet clean and tidy to prevent you from falling.

Always do the following:

- Do not spill oil or grease.
- Do not leave tools laying about.
- Watch your step when walking.

Never jump down from the machine. When getting on or off the machine, use the steps and handrails, and maintain a three point contact (both feet and one hand or both hands and one foot) to support yourself securely.

If the job requires it, wear protective clothing.

To prevent injury from slipping or falling, when working on the hood or covers, never use any part except the inspection passage fitted with nonslip pads.



Figure 33

## Lock Inspection Covers

When carrying out maintenance with the inspection cover open, lock the cover securely in position with the lock bar.

If maintenance work is carried out with the inspection cover open but not locked, there is danger that it may suddenly close and cause injury if there is a gust of wind.



## Crushing Prevention and Cutting Prevention

You should always have at least two people working together if the engine must be run during service. One person needs to remain in the operator's seat, ready to work the controls or stop the machine and shut off the engine.

Unless you are instructed otherwise, never attempt adjustments while the machine is moving or while the engine is running.

Stay clear of all rotating parts and moving parts.

Keep objects away from moving fan blades. The fan blades will throw objects and the fan blades can cut objects.

Do not use a wire rope cable that is kinked or flayed. Wear gloves when you handle a wire rope cable.

When you strike a retainer pin, the retainer pin might fly out. The loose retainer pin can injure personnel. Make sure that the area is clear of people when you strike a retainer pin. To avoid injury to your eyes, wear protective glasses when you strike a retainer pin.



Figure 34

## Track Tension Adjustments Require Caution

Never turn out the track tension grease fitting nut. To release pressure from the core frame track tension assembly, you should NEVER attempt to disassemble the track adjuster or attempt to remove the grease fitting or valve assembly.

Keep your face and body away from the valve. Refer to the track adjustment procedure in the Operator and Maintenance Manual or Shop Manual.

## Supports and Blocking for Work Equipment

Do not allow weight or equipment loads to remain suspended.

Lower everything to the ground before leaving the operator's seat.

Do not use hollow, cracked or unsteady wobbling supports.

Do not work under any equipment supported only by a lifting jack.

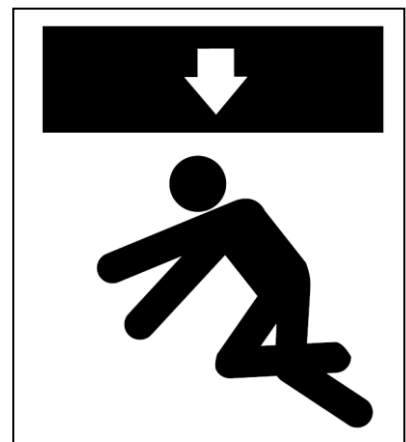


Figure 35

## Action When Abnormality Is Found During Inspection

If any abnormality is found during inspection, always carry out repairs. In particular, if the machine is used when there are still problems with the brake or work equipment systems, it may lead to serious injury.

If necessary depending on the type of failure, please contact your EVERDIGM distributor for repairs.

## Precautions with High-pressure Lines, Tubes and Hoses

When inspecting or replacing high-pressure piping or hoses, check that the pressure has been released from the circuit. Failure to release the pressure may lead to serious injury.

Always do the following:

- Wear protective glasses and leather gloves.
- Fluid leaks from hydraulic hoses or pressurized components can be difficult to see but pressurized oil has enough force to pierce the skin and cause

serious injury. Always use a piece of wood or cardboard to check for suspected hydraulic leaks. Never use your hands or expose your fingers.

- Do not bend high-pressure lines. Do not strike high pressure lines. Do not install lines, tubes or hoses that are bent or damaged.
- Make sure that all clamps, guards and heat shields are installed correctly to prevent vibration, rubbing against other parts, and excessive heat during operation.
  - If any of the following conditions are found, replace the part.
  - Damage or leakage from hose end.
  - Wear, damage, cutting of covering, or exposure of strengthening wire layer.
  - Cover portion is swollen in places.
  - There is twisting or crushing at movable parts of hose.
  - Foreign material is embedded in the covering.
  - Hose end is deformed.



Figure 36

**NOTE:** Refer to "Hose In-service Lifetime Limit (European Standard ISO 8331 and EN982 CEN)" in the Operation and Maintenance Manual, for additional European regulations.

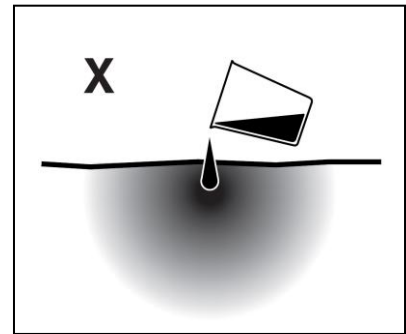
## Waste Materials

Physical contact with used motor oil may pose a health risk.

Wipe oil from your hands promptly and wash off any remaining residue.

Used motor oil is an environmental contaminant and may only be disposed of at approved collection facilities. To prevent pollution of the environment, always do the following:

- Never dump waste oil in a sewer system, rivers, etc.
- Always put oil drained from your machine in containers. Never drain oil directly onto the ground.
- Obey appropriate laws and regulations when disposing of harmful materials such as oil, fuel, solvent, filters, and batteries.



**Figure 37**

## 1.13 Battery

### Battery Hazard Prevention

Battery electrolyte contains diluted sulfuric acid and batteries generate hydrogen gas. Hydrogen gas is highly explosive, and mistakes in handling them can cause serious injury or fire. To prevent problems, always do the following:

- Do not smoke or bring any flame near the battery.
- When working with batteries, ALWAYS wear safety glasses and rubber gloves.
- If you spill battery electrolyte on yourself or your clothes, immediately flush the area with water.
- If battery electrolyte gets into your eyes, flush them immediately with large quantities of water and see a doctor at once.
- If you accidentally drink battery electrolyte, drink a large quantity of water or milk, raw egg or vegetable oil. Call a doctor or poison prevention center immediately.
- When cleaning the top surface of the battery, wipe it with a clean, damp cloth. Never use gasoline, thinner, or any other organic solvent or detergent.
- Tighten the battery caps securely.
- If the battery electrolyte is frozen, do not charge the battery or start the engine with power from another source. There is danger that the battery may catch fire.
- When charging the battery or starting with power from another source, let the battery electrolyte melt and check that there is no leakage of battery electrolyte before starting the operation.
- Always remove the battery from the machine before charging.

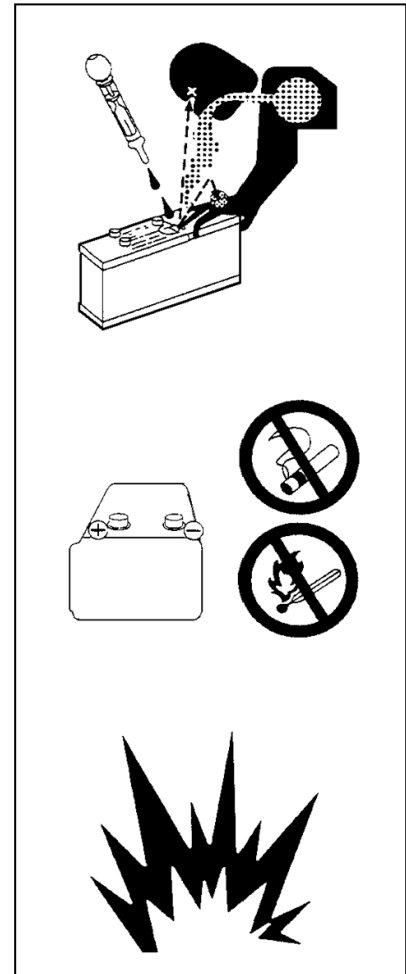


Figure 38

## Boost Starting or Charging Engine Batteries

If any mistake is made in the method of connecting the booster cables, it may cause an explosion or fire. Always do the following:

- Turn off all electrical equipment before connecting leads to the battery. This includes electrical switches on the battery charger or boost starting equipment.
- When boost starting from another machine or vehicle do not allow the two machines to touch. Wear safety glasses or goggles while required battery connections are made.
- 24 volt battery units consisting of two series connected twelve volt batteries have a cable connecting one positive terminal on one of the 12 volt batteries to a negative terminal on the other battery. Booster or charger cable connections must be made between the nonseries connected positive terminals and between the negative terminal of the booster battery and the metal frame of the machine being boosted or charged. Refer to the procedure and illustration in "Starting Engine With a Booster Cable" in the Operation and Maintenance Manual.
- Connect positive cable first when installing cables and disconnect the negative cable first when removing them. The final cable connection, at the metal frame of the machine being charged or boost started, should be as far away from the batteries as possible.

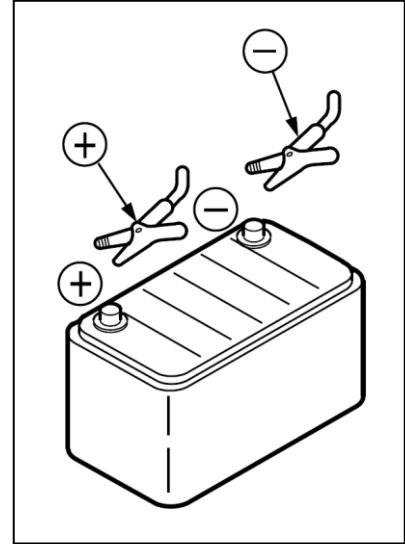


Figure 39

## 1.14 Towing

### Precautions When Towing

If any mistake is made in the method of selecting or inspecting the towing wire or in the method of towing, it may lead to serious personal injury. Always do the following:

- Always use the method of towing given in this Operation and Maintenance Manual. Do not use any other method.
- Use leather gloves when handling the wire rope.
- When carrying out the preparation work for towing with two or more workers, determine the signals to use and follow these signals correctly.
- Always fit the towing rope to the left and right hooks and secure in position.
- If the engine on the problem machine will not start or there is a failure in the brake system, always contact your EVERDIGM distributor.
- Never go between the towing machine and the towed machine during the towing operation.
- It is dangerous to carry out towing on slopes, so select a place where the slope is gradual. If there is no place where the slope is gradual, carry out operations to reduce the angle of the slope before starting the towing operation.
- When towing a problem machine, always use a wire rope with a sufficient towing capacity.
- Do not use a frayed, kinked rope or a rope with any loss of diameter.
- Do not use the lightweight towing hook for towing another machine.

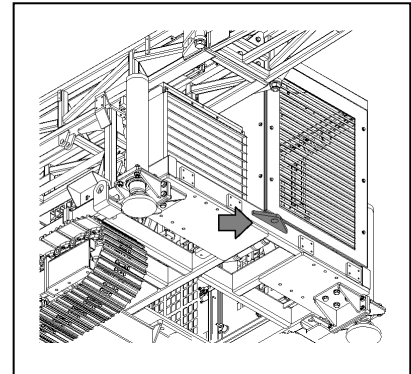


Figure 40

## 1.15 Shipping and Transportation

### Obey State and Local Over-the-Road Regulations

Check state and local restrictions regarding weight, width and length of a load before making any other preparation for transport.

The hauling vehicle, trailer and load must all be in compliance with local regulations governing the intended shipping route.

Partial disassembly or teardown of the drill ring may be necessary to meet travel restrictions or particular conditions at the work site. See the Shop Manual for information on partial disassembly.

Refer to the Transportation and Shipping section of this Operation and Maintenance Manual for information on loading, unloading and towing.

### Lifting with Sling



#### **WARNING!**

Improper lifting can allow load to shift and cause injury or damage.

1. Refer to Specification section of Operation and Maintenance Manual for information on weight and dimensions.
2. Use properly rated cables and slings for lifting.
3. Position machine for a level lift.
4. Lifting cables should have a long enough length to prevent contact with the machine. Spreader bars may be required.

If spreader bars are used, be sure that cables are properly secured to them and that the angle of the cables is factored into the lift strength.

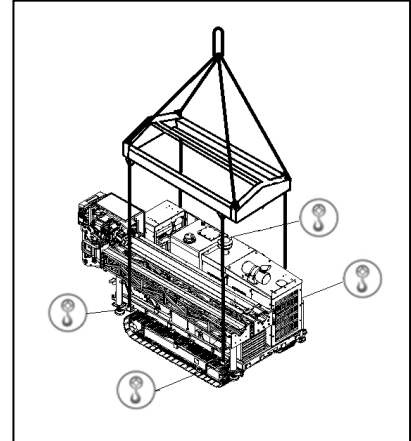


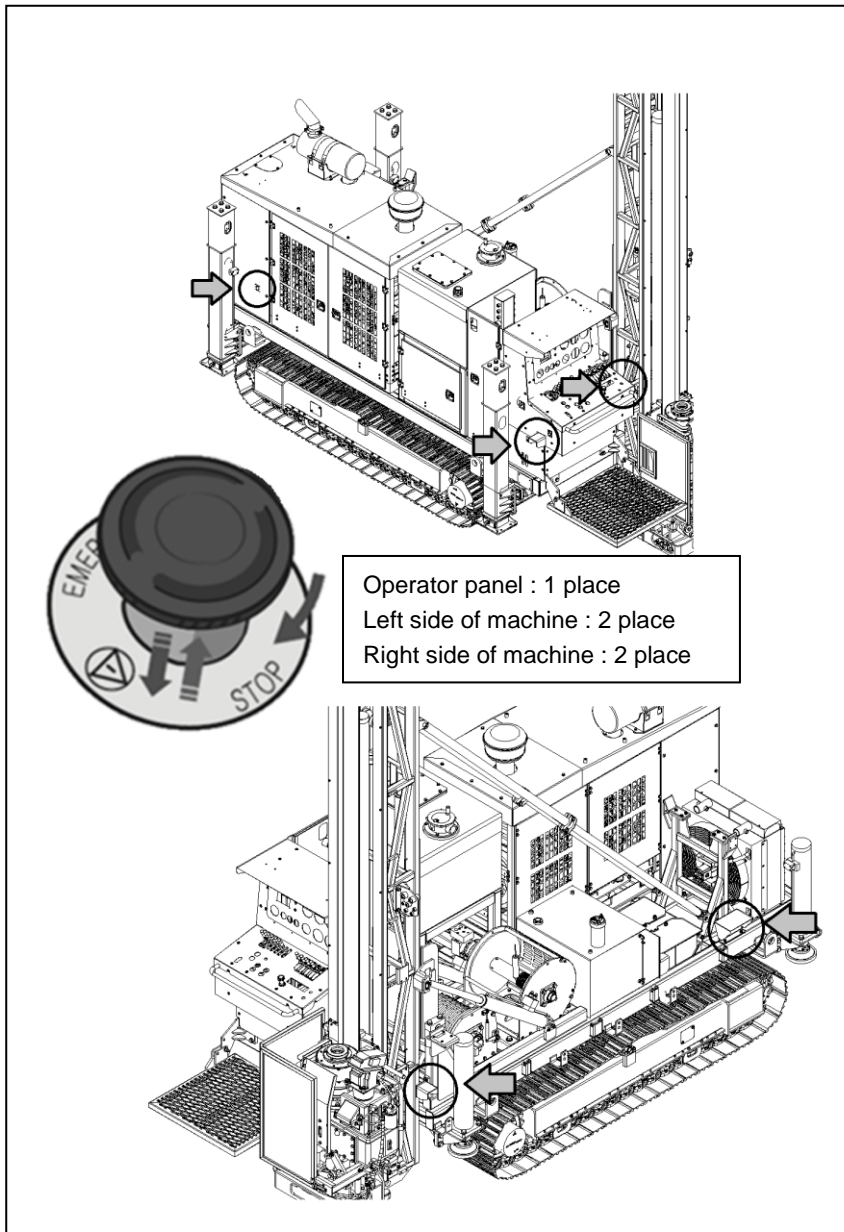
Figure 41

## 1.16 Location of emergency switches

### Remember the locations of emergency switch

Always check the status of emergency switches and remember the locations. When danger situation is encountered or predicted, do not hesitate to operate emergency switch to stop the machine operation.

Failed switch should be replaced with new one.





## 1.17 Special pay attention while components are moving

### Check interruption of components

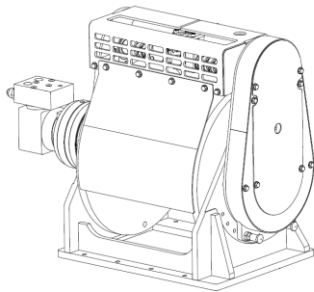
For traveling safety, the mast can be folded.

Before folding mast, check the movement of mast if components are contacting each other, or hoses are bent severely.

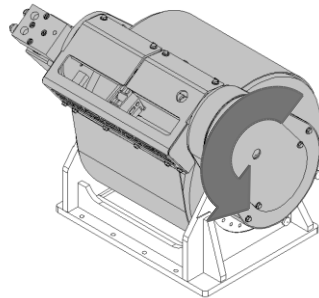


#### **WARNING!**

Before placing mast to horizontal position, rotate and fold level winder to prevent damage.



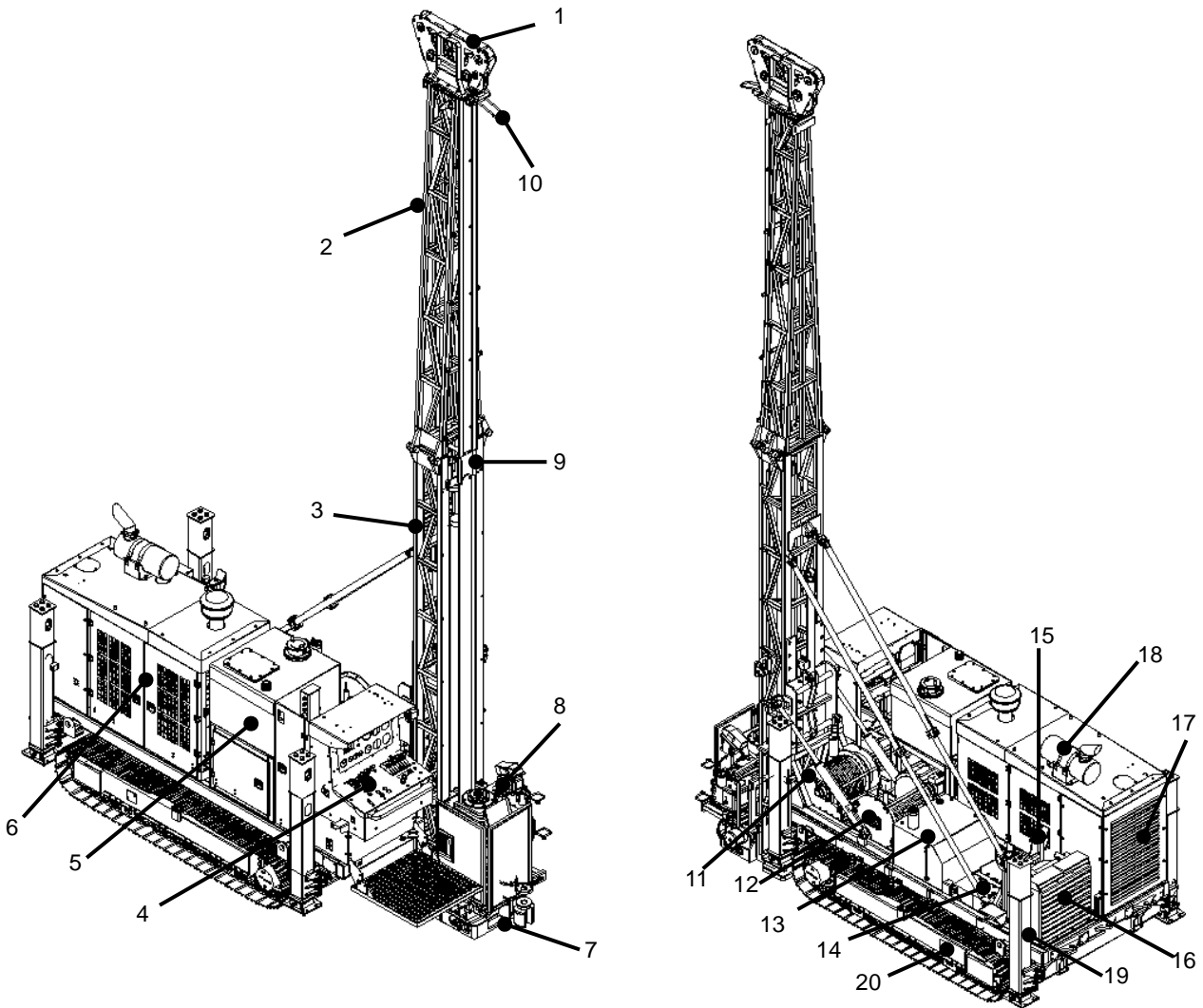
< Normal working position >



<When mast is placed to horizontal position >

## 2. Product information

### 2.1 Names of components

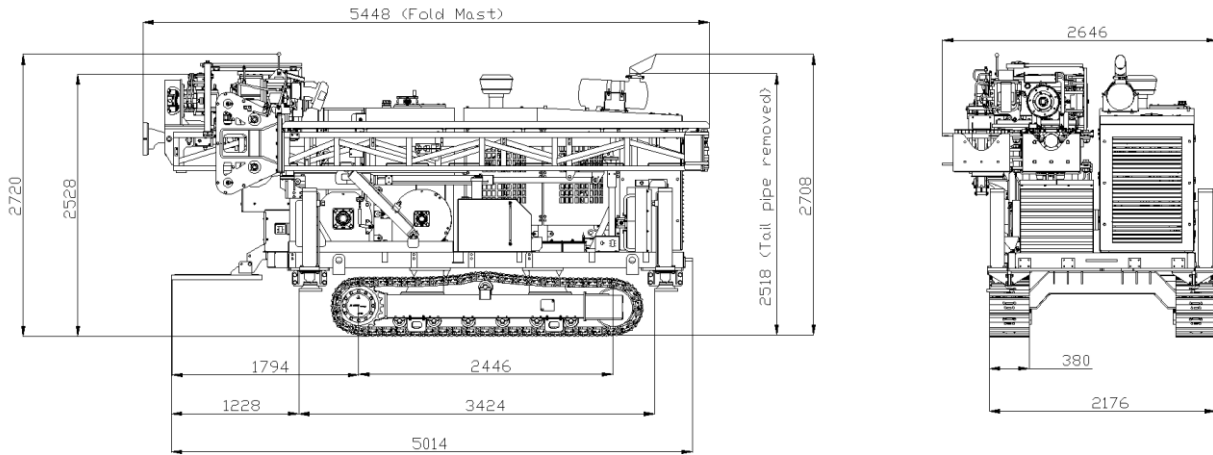


No.	Description	No.	Description
1	Crown block	11	Main winch
2	Upper mast	12	Wireline winch
3	Lower mast	13	Fuel tank
4	Control panel	14	Battery box
5	Hydraulic oil tank	15	Mast support
6	Power unit	16	Oil cooler
7	Foot clamp	17	Radiator
8	Rotary head	18	Muffler
9	Rod kicker	19	Outrigger
10	Upper hoist limit	20	Track

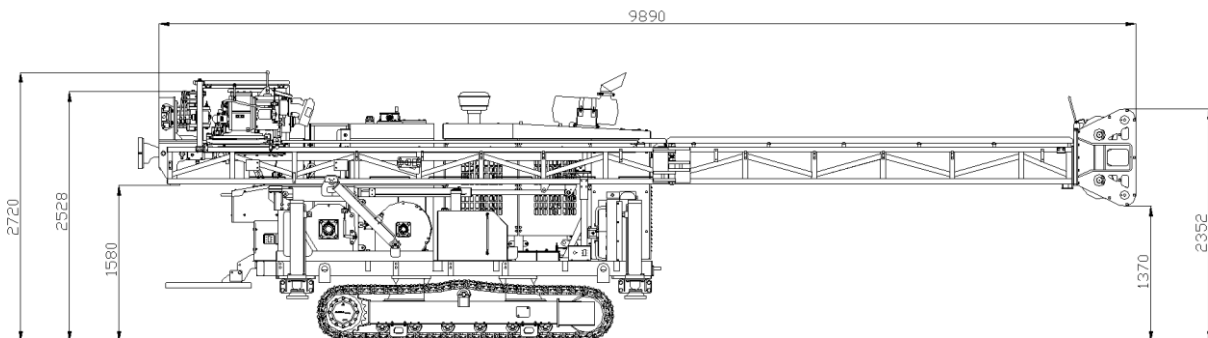
\* For more details, please refer to parts manual.

## 2.2 External Dimensions

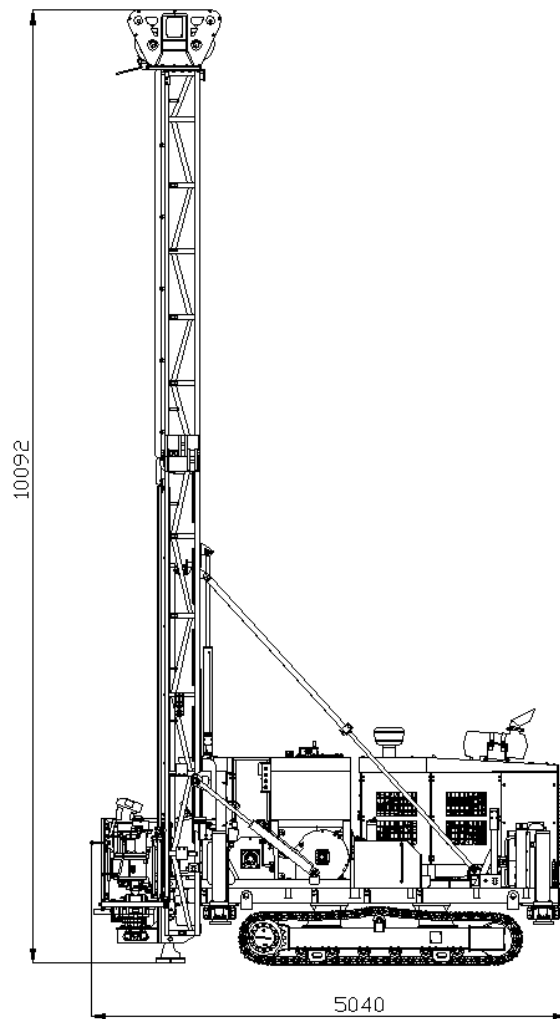
### TRANSPORT DIMENSION (top mast folded)



### OVERALL DIMENSION (mast extended- horizontal)



**OVERALL DIMENSION**  
*(mast extended-vertical)*



## 2.3 ECR12 Technical specifications

### DRILLING CAPACITY

B wireline: ..... 1,500 m (4,921 ft)  
 N wireline: ..... 1,190 m (3,904 ft)  
 H wireline: ..... 790 m (2,592 ft)  
 P wireline: ..... 480 m (1,575 ft)

*The figures have been calculated. Actual drilling depth will depend on in-hole tools, conditions, and drilling techniques.*

### POWER UNIT

Manufacture: ..... Cummins  
 Model: ..... 6CTAA8.3C, Tier2  
 Displacement: ..... 8.3 L, 6 cylinders  
 Power: ..... 152 kW (205 hp)  
 RPM: ..... 2,200  
 Engine type: ..... Turbocharged, after cooled diesel engine  
 Cooling: ..... Water  
 Electrical system: ..... 24 V (Alternator 24V/70A)

### HYDRAULIC SYSTEM

Primary pump: ..... Axial piston, variable displacement  
 28 MPa, 180 Lpm (4,061 psi, 47 gpm)  
 Secondary pump: ..... Axial piston, variable displacement  
 20 MPa, 70 Lpm (2,900 psi, 18 gpm)  
 1st auxiliary pump: ..... Gear, fixed displacement  
 15 MPa, 35 Lpm (2,176 psi, 9 gpm)  
 2nd auxiliary pump: ..... Gear, fixed displacement  
 11 MPa, 35 Lpm (1,595 psi, 9 gpm)  
 3rd auxiliary pump: ..... Gear, fixed displacement  
 20 MPa, 9.3 Lpm (2,900 psi, 2.5 gpm)  
 Hydraulic oil cooling: ..... Air

### ROTARY HEAD

Drill head type: ..... Side shift head  
 Rotation motor: ..... Variable/reversible hydraulic motor  
 Transmission: ..... Mechanical, 4 speed  
 Final drive: ..... Gear driven in oil bath

RPM and torque rating:

	Gear ratio	Final drive ratio	Speed, RPM	Torque, Nm (lb-ft)
1st gear:	7.16 :1	2.5 : 1	134 - 189	4,155 - 2,947 (3,064 - 2,173)
2nd gear:	3.17 :1		303 - 426	1,847 - 1,310 (1,362 - 966)
3rd gear:	1.76 :1		538 - 758	1,039 - 737 (766 - 564)
4th gear:	1.00 :1		968 - 1,364	577 - 409 (425 - 313)

Chuck assembly:

Type: ..... Hydraulic opened, fail safe spring closed  
 Maximum inside diameter: ..... 117 mm (4 5/8 inch)  
 Holding capacity: ..... 18,144 kg (40,000 lb)

## **FOOT CLAMP**

Type: ..... Hydraulically opened/closed, mechanical fail-safe  
Maximum rod size: ..... PW - 139.7 mm (5 1/2 inch)

## **MAST AND FEED SYSTEM**

Feed travel: ..... 3.25 m (10.7 ft)  
Feed speed: ..... Fast and slow with variable control  
Thrust capacity: ..... 45.3 kN (10,176 lb)  
Pull capacity: ..... 114.6 kN (25,761 lb)  
Drilling angle: ..... 45 to 90 degrees  
Rod pull length: ..... 6 m (19.7 ft)

## **MAIN HOIST**

Line pull capacity: ..... 79.4 kN (17,857 lb) at bare drum  
Line speed: ..... 41 m/min (134 ft/min) at bare drum  
Cable size (diameter): ..... 16 mm (0.63 inch)  
Cable length: ..... 30 m (98 ft)

## **WIRELINE HOIST**

Line pull capacity and line speed:

	Line pull capacity	Line speed
At bare drum:	10.5 kN (2,361 lb)	115 m/min (377 ft/min)
At full drum:	3.1 kN (700 lb)	390 m/min (1,280 ft/min)

Cable size (diameter): ..... 5 mm (4.763, 3/16") or 6 mm (5.556, 7/32")  
Cable length: ..... 1,500 m (4,291 ft)

## **OUTRIGGER**

Support: ..... 4 hydraulic leveling jacks  
Pad diameter: ..... 220 mm (8.66 inch)  
Travel length: ..... 600 mm (23.6 inch)

## **CRAWLER**

Crawler track type: ..... Steel, 3 rib grouser plate  
Crawler width: ..... 380 mm (15 inch)  
Travel max speed: ..... 3.3 km/h (2.1 mile/h)  
Max. grade: ..... 20 degrees  
Travel control: ..... Manual or optional remote controlled

## **WEIGHT AND DIMENSIONS**

Weight: ..... 8,000 kg (17,636 lb)  
Transport dimensions (L-W-H)  
Top mast folded position: ..... 5,240 - 2,695 - 2,690 mm (17.19 - 8.83 - 8.3 ft)

*Weight and dimensions are approximations based on the rig with standard equipment and should be checked before crating and lifting.*

## **STANDARD EQUIPMENT**

- Manual controlled crawler
- 4 hydraulic leveling jacks
- Rod kicker
- Drill speed gage
- Mud pump pressure gauge
- Front, rear headlight and work light
- Hydraulic connection for mud pump and mud mixer
- Mechanically fail safe hydraulic foot clamp
- Side shift rotary head
- Rotation guard
- Rod make-up / break-out
- Wire line hoist
- Centralized grease lines for crown pulley

*Chuck and foot clamp are equipped with HQ-sized jaws as a standard. Upon request, chuck can be equipped with BQ/NQ/PQ-sized jaws, foot clamp can be equipped with BQ/NQ/PQ/PW-sized jaws.*

## **OPTIONS**

- Hydraulic driven water pump
  - Manufacture: ..... American manufacturing
  - Model: ..... AW1122BCD
  - Max flow: ..... 130 Lpm (34.3 gpm)
  - Max pressure: ..... 5 MPa (725.2 psi)
- Hydraulic driven mud mixer
  - Max flow:..... 56.7 Lpm (15 gpm)
  - Max pressure:.....10.4 MPa (1500 psi)
- Remote controlled crawler (cable and wireless control available simultaneously)
- Wireline hoist with level winder
- Extendable outrigger
- Upper hoist limit
- Spin cage with safety device
- Side safety guard
- Dimension kit
  - BQ chuck jaw/bushing kit & foot clamp jaw kit
  - NQ chuck jaw/bushing kit & foot clamp jaw kit
  - HQ chuck jaw/bushing kit & foot clamp jaw kit
  - PQ chuck jaw/bushing kit & foot clamp jaw kit
  - PW foot clamp jaw kit

## 2.4 ECR18 Technical specifications

### DRILLING CAPACITY

B wireline: ..... 2,250 m (7,382 ft)  
 N wireline: ..... 1,780 m (5,840 ft)  
 H wireline: ..... 1,180 m (3,871 ft)  
 P wireline: ..... 800 m (2,625 ft)

*The figures have been calculated. Actual drilling depth will depend on in-hole tools, conditions, and drilling techniques.*

### POWER UNIT

Manufacture: ..... Cummins  
 Model: ..... 6CTAA8.3C, Tier2  
 Displacement: ..... 8.3 L, 6 cylinders  
 Power: ..... 193 kW (260 hp)  
 RPM: ..... 2,200  
 Engine type: ..... Turbocharged, after cooled diesel engine  
 Cooling: ..... Water  
 Electrical system: ..... 24 V (Alternator 24V/70A)

### HYDRAULIC SYSTEM

Primary pump: ..... Axial piston, variable displacement  
 28 MPa, 250 Lpm (4,061 psi, 66 gpm)  
 Secondary pump: ..... Axial piston, variable displacement  
 20 MPa, 70 Lpm (2,900 psi, 18 gpm)  
 1st auxiliary pump: ..... Gear, fixed displacement  
 17 MPa, 35 Lpm (1,450 psi, 9 gpm)  
 2nd auxiliary pump: ..... Gear, fixed displacement  
 11 MPa, 35 Lpm (1,450 psi, 9 gpm)  
 3rd auxiliary pump: ..... Gear, fixed displacement  
 20 MPa, 9.3 Lpm (2,900 psi, 2.5 gpm)  
 Hydraulic oil cooling: ..... Air

### ROTARY HEAD

Drill head type: ..... Side shift head  
 Rotation motor: ..... Variable/reversible hydraulic motor  
 Transmission: ..... Mechanical, 4 speed  
 Final drive: ..... Gear driven in oil bath

RPM and torque rating:

	Gear ratio	Final drive ratio	Speed, RPM	Torque, Nm (lb·ft)
1st gear:	7.16 :1	2.5 : 1	128 - 178	5,541 - 3,990 (4,086 - 2,942)
2nd gear:	3.17 :1		288 - 400	2,462 - 1,774 (1,815 - 1,308)
3rd gear:	1.76 :1		511 - 711	1,385 - 998 (1,021 - 736)
4th gear:	1.00 :1		920 - 1,200	700 - 554 (567 - 408)

Chuck assembly:

Type: ..... Hydraulic opened, fail safe spring closed  
 Maximum inside diameter: ..... 117 mm (4 5/8 inch)  
 Holding capacity: ..... 18,144 kg (40,000 lb)



## **FOOT CLAMP**

Type: ..... Hydraulically opened/closed, mechanical fail-safe  
Maximum inside diameter: ..... 170 mm (6.7 inch)

## **MAST AND FEED SYSTEM**

Feed travel: ..... 3.5 m (11.5 ft)  
Feed speed: ..... Fast and slow with variable control  
Thrust capacity: ..... 69.0 kN (15,505 lb)  
Pull capacity: ..... 171.2 kN (38,481 lb)  
Drilling angle: ..... 45 to 90 degrees  
Rod pull length: ..... 6 m (19.7 ft)

## **MAIN HOIST**

Line pull capacity: ..... 117.7 kN (26,455 lb) at bare drum  
Line speed: ..... 40 m/min (131 ft/min) at bare drum  
Cable size (diameter): ..... 20 mm (0.79 inch)  
Cable length: ..... 30 m (98 ft)

## **WIRELINE HOIST**

Line pull capacity and line speed:

	Line pull capacity	Line speed
At bare drum:	10.5 kN (2,361 lb)	115 m/min (377 ft/min)
At full drum:	2.54 kN (571 lb)	478 m/min (1,568 ft/min)

Cable size (diameter): ..... 5 mm (4.763, 3/16")  
Cable length: ..... 2,300 m (7,546 ft)

## **OUTRIGGER**

Support: ..... 4 hydraulic leveling jacks  
Pad diameter: ..... 220 mm (8.66 inch)  
Travel length: ..... 600 mm (23.6 inch)

## **CRAWLER**

Crawler track type: ..... Steel, 3 rib grouser plate  
Crawler width: ..... 380 mm (15 inch)  
Travel max speed: ..... 3.3 km/h (2.1 mile/h)  
Max. grade: ..... 20 degrees  
Travel control: ..... Manual or optional remote controlled

## **WEIGHT AND DIMENSIONS**

Weight: ..... 9,000 kg (19,841 lb)  
Transport dimensions (L-W-H)  
Top mast folded position: ..... 5,240 - 2,695 - 2,690 mm (17.19 - 8.83 - 8.3 ft)

*Weight and dimensions are approximations based on the rig with standard equipment and should be checked before crating and lifting.*

## **STANDARD EQUIPMENT**

- Manual controlled crawler
- 4 hydraulic leveling jacks
- Rod kicker
- Drill speed gage
- Mud pump pressure gauge
- Front, rear headlight and work light
- Hydraulic connection for mud pump and mud mixer
- Mechanically fail safe hydraulic foot clamp
- Side shift rotary head
- Rotation guard
- Rod make-up / break-out
- Wire line hoist
- Centralized grease lines for crown pulley

*Chuck and foot clamp are equipped with HQ-sized jaws as a standard. Upon request, chuck can be equipped with BQ/NQ/PQ-sized jaws, foot clamp can be equipped with BQ/NQ/PQ/PW-sized jaws.*

## **OPTIONS**

- Hydraulic driven mud pump
  - Manufacture:..... American manufacturing
  - Model:..... AW1122BCD
  - Max flow: ..... 130 Lpm (34.3 gpm)
  - Max pressure:..... 5 MPa (725.2 psi)
- Hydraulic driven mud mixer
  - Max flow:..... 56.7 Lpm (15 gpm)
  - Max pressure:..... 10.4 MPa (1500 psi)
- Remote controlled crawler (cable and wireless control available simultaneously)
- Wireline hoist with level winder
- Extendable outrigger
- Upper hoist limit
- Spin cage with safety device
- Side safety guard
- Dimension kit
  - BQ chuck jaw/bushing kit & foot clamp jaw kit
  - NQ chuck jaw/bushing kit & foot clamp jaw kit
  - HQ chuck jaw/bushing kit & foot clamp jaw kit
  - PQ chuck jaw/bushing kit & foot clamp jaw kit
  - PW foot clamp jaw kit

## 2.5. Information for ordering parts and service



### IMPORTANT!

Parts may subject to changed for improvement. It is highly recommended ordering parts with equipment serial number.

Using non-genuine or improper parts may cause shorten equipment parts life, or serious damages on related parts.

The machine serial number is marked with the type and serial number on the nameplate. It is important to make correct reference to the serial number of the equipment when making repairs or ordering spare parts. Identification by serial number is the only proper means of maintaining and identifying parts for specific machine.

### Model Code and Serial Number

( ○ : Number, □ : Alphabet )

Model code: **ECROO**

Serial Number : **□○○○**

Example : ECR18

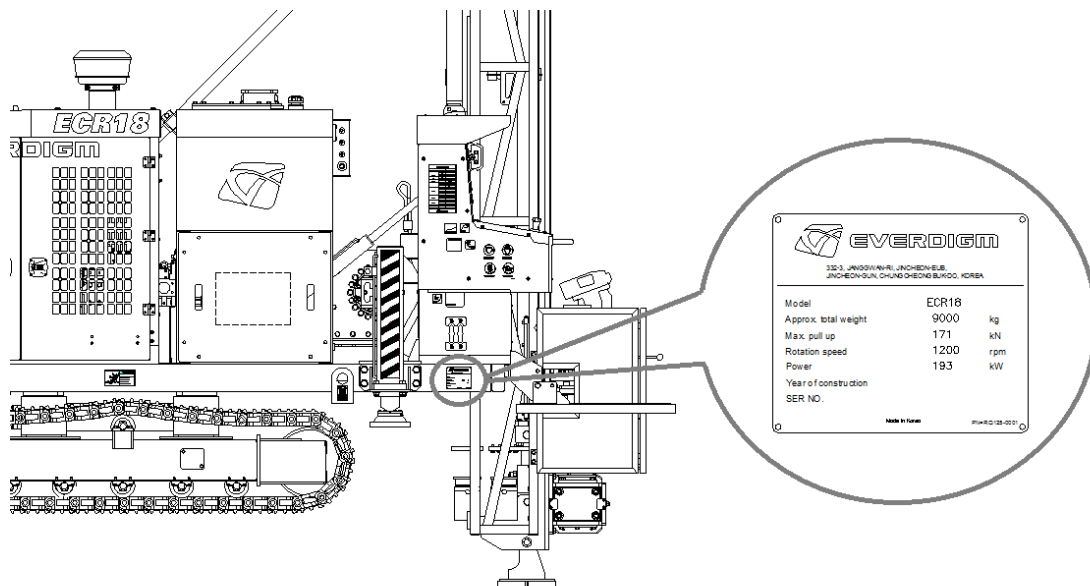
Example : H001

ECR : Product prefix (Drill Rig Model Code)

H : Factory code

18 : Pull back capacity

001 : Serial number



### 3. Towing, lifting and transporting method



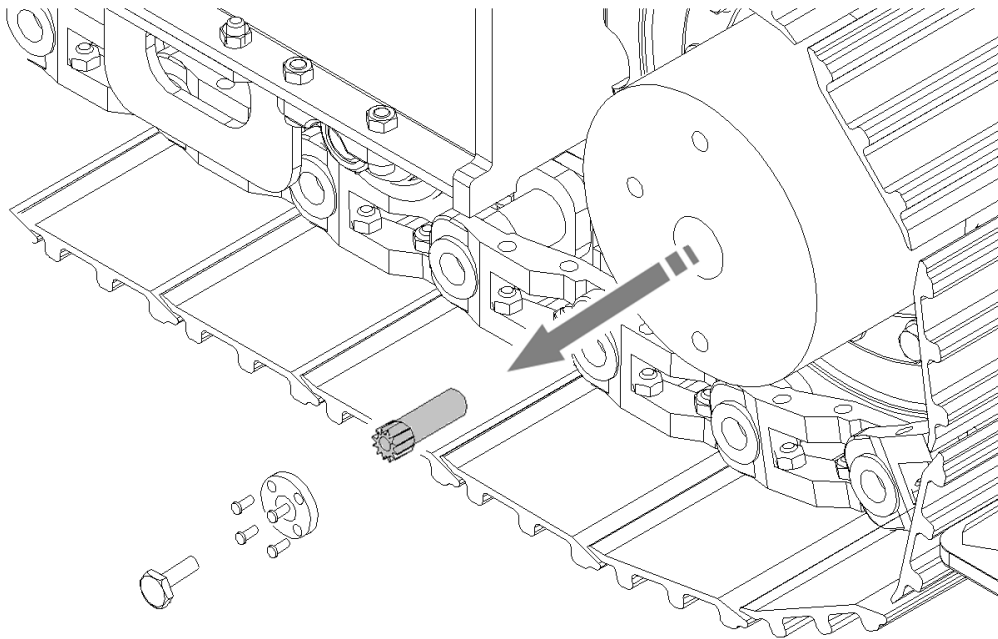
#### **DANGER!**

Follow local road safety regulations on weight, width and height limits. (Transporting)

Check strength of wire and hook condition and weight capacity before towing and lifting equipment.

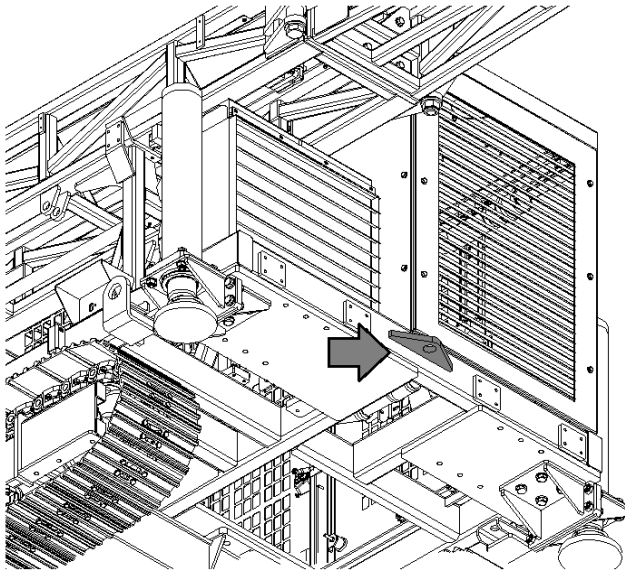
Do not stay inside of cabin or operate equipment while it is towed, lifted and moved by trailer.

#### 3.1 Towing



- ① Before releasing brake, the equipment should stand on flat ground, or supported firmly with high strength wires on uneven ground.
- ② Dismantle plug from travel motor.
- ③ Dismantle cover plate from travel motor.
- ④ Remove drive gear from inside of travel motor.
- ④ Assemble and tighten cover plate and plug.

► Hook points

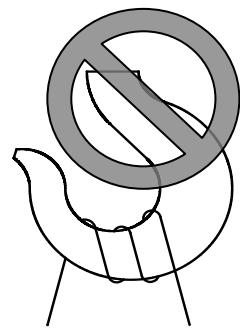


< Rear Side >

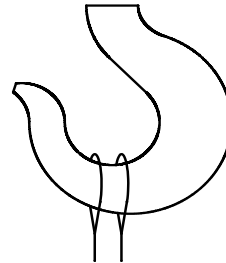
► Note

- : Hook point location or shape may differ according to core drill model.
- : After towing, replace gear oil as describes "[5.4.10 Travel motor oil replacement](#)".

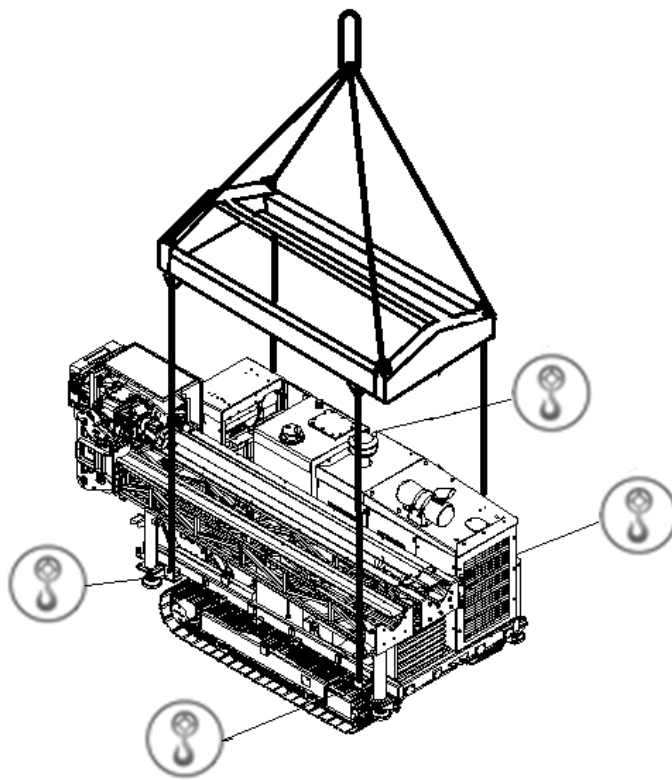
### 3.2. Lifting



Incorrect



Correct

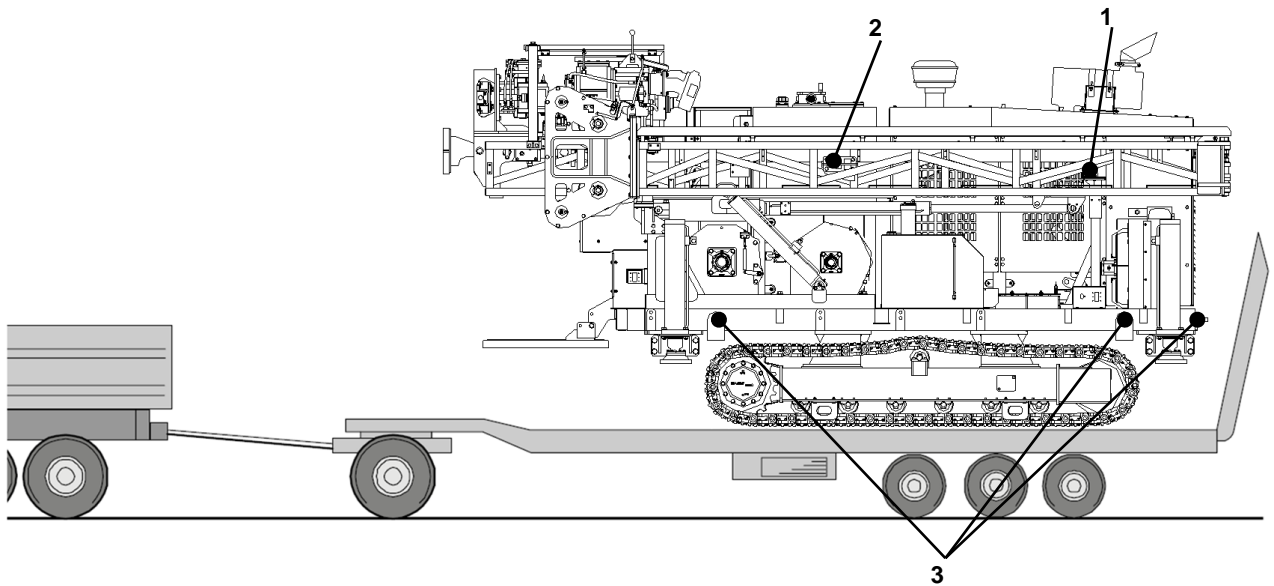


- Wires and blocks which support the machine should be strong to lift it.
- Mast should be folded and firmly settled on the supporter. No movement of mast is allowed.
- Wires should not touch mast or bonnet during lifting procedure.
- Do not wind wire on hook. Wire should be securely hold.

### 3.3. Transportation

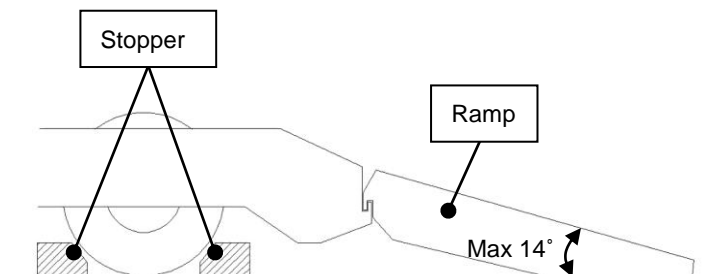
- **Guideline for transportation**

- ① Fold mast, and set the mast to horizontal position.
- ② Mast should be firmly settled on the supporter above the frame. If possible, tied up the mast with supporter and trailer.
- ③ Tied up equipment with trailer bed correctly.



- **Loading and unloading on trailer**

- ① Width of trailer should be wider than equipment track.
- ② Pay special attention for driving when the equipment is loaded on the trailer.
- ③ Fix ramps on the trailer tightly, and angle of slope need to be less than 15 degree from ground.



## 4. Operation

---



### **DANGER!**

Follow recommended guideline on this chapter. Improper operating method will cause injury or death of person, and damages to equipment.

Only trained and skilled operator can operate the equipment. Do not leave from the operator panel while it is in operation.

Do not stand nearby machine.

Never attempt operate the machine when danger situation is predicted.

Failure or damage on machine is noticed, stop the machine immediately. Then, put warning stickers or label to alert others until being repaired.

### 4.1. Before operation

#### ● Operator

- √ Operator should be in good condition before operation.
- √ Wear safety helmet, goggle, shoes and others for safety.

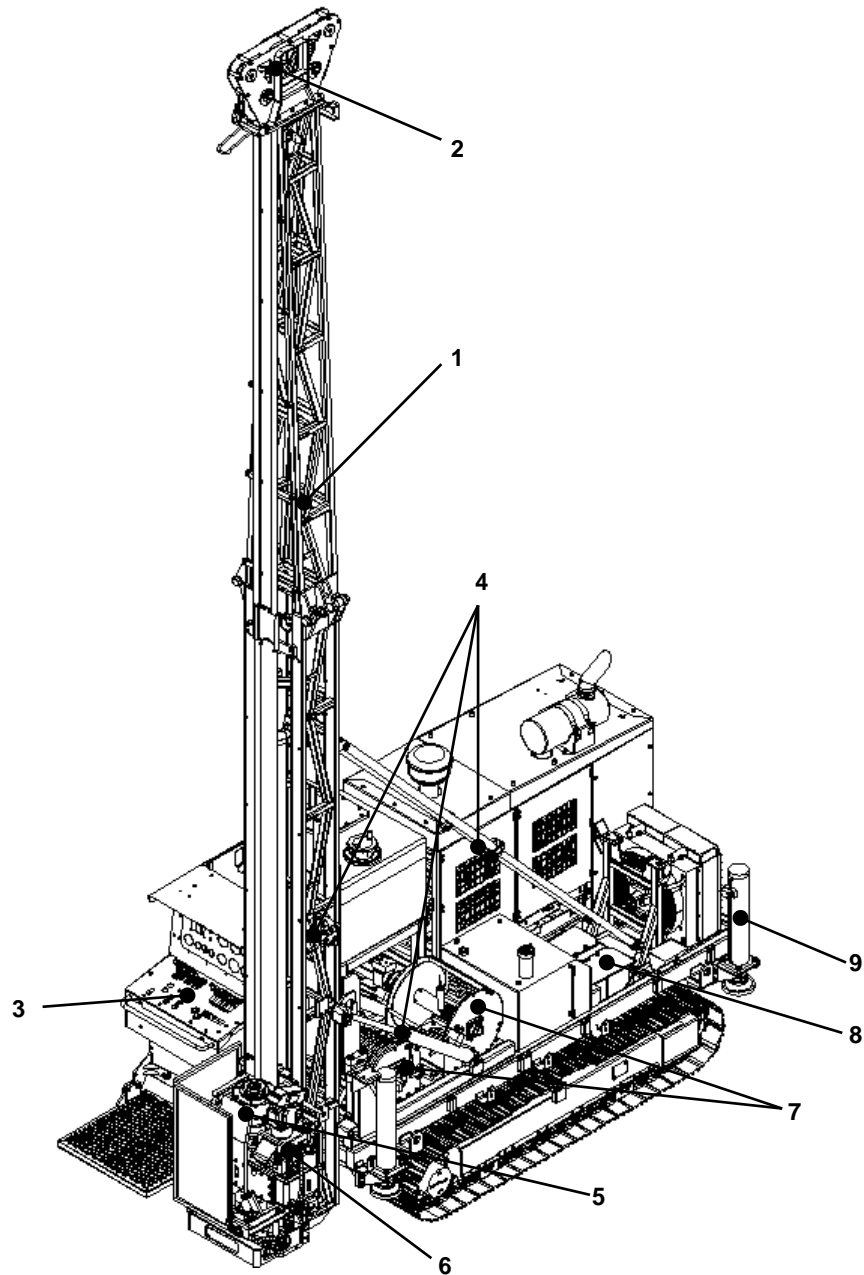
#### ● Drilling machine

- √ Check wear status of sliding and rotating parts
- √ Check oil leakage on hydraulic parts, fittings and hoses.
- √ Check lubricating oil flow condition on rotation unit, and apply grease.
- √ Check greasing condition on moving parts, and apply grease.
- √ Check external condition of main parts whether it is deformed, bent or cracked.
- √ Check fasteners (bolts and nuts) and pins whether it is loosen.
- √ Check remained amount of engine oil, compressor oil, hydraulic oil, rotary head lubricant and fuel on tanks.
- √ Check tensions on chain, track, hoses on mast and fan belt on engine.
- √ Drain water on fuel separator and fuel tank.

☞ See the details in Chapter "[5. Maintenance](#)"



#### 4.1.1 Check points before operation



*Figure: Check points.*

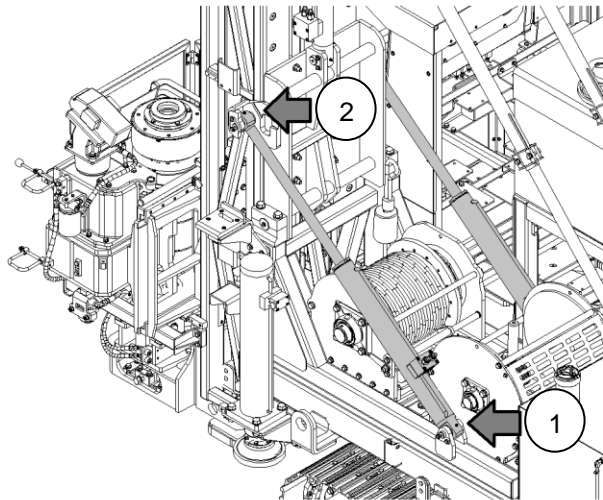
Check point	Parts	Instruction
1	Mast	Wear, deformation, crack or damage
2	Wire line pulley	Wire condition, deformation and wear
3	Control levers and switches	Functionality
4	Cylinders	Oil leakage
5	Chuck	Wear or damage on jaw bites
6	Transmission lever	Damage and functionally check
7	Wire winches	Functionally check, Damage check

Check point	Parts	Instruction
8	Battery	Electric line connection status
9	Outrigger	Oil leakage (Internal & External)
-	Hose and pipe	Oil, fuel or gas leakage
-	Wires	Wear, loose, bending and breakage check

#### 4.1.2 Lubrication points

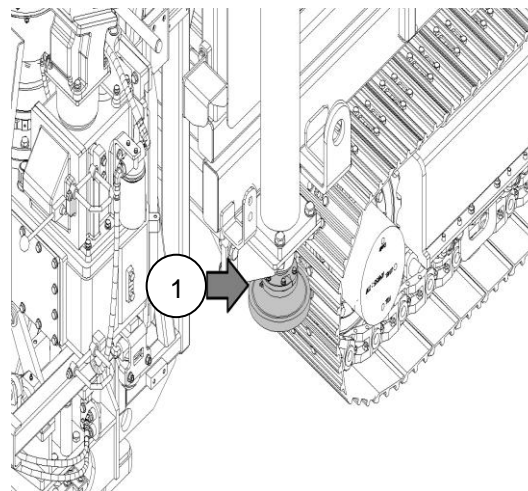
- Mast raise cylinders

- ① Lower mast raise cylinder pin (2 places)
- ② Upper mast raise cylinder pin (2 places)



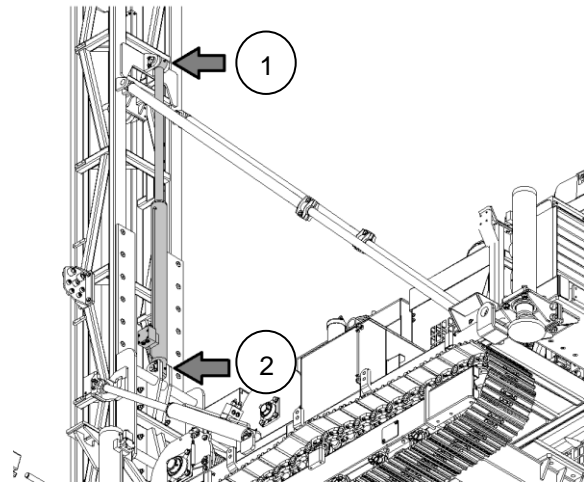
- Outrigger pad

- ① Outrigger pad (4 places)



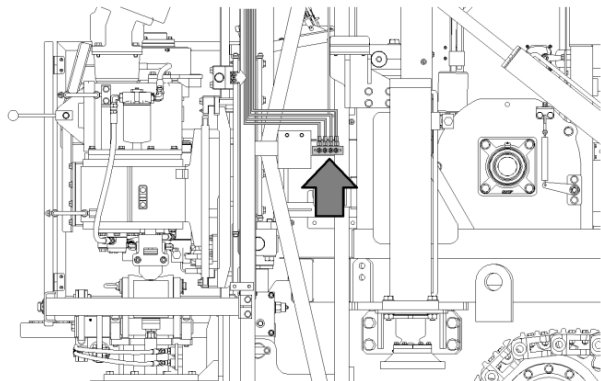
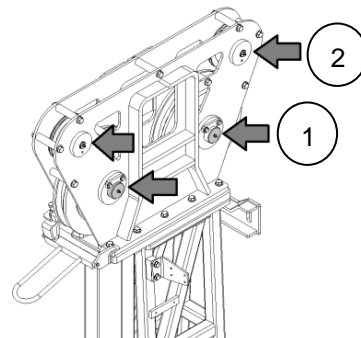
● **Mast dump cylinder**

- ① Upper cylinder (1 place)
- ② Lower cylinder (1 place)



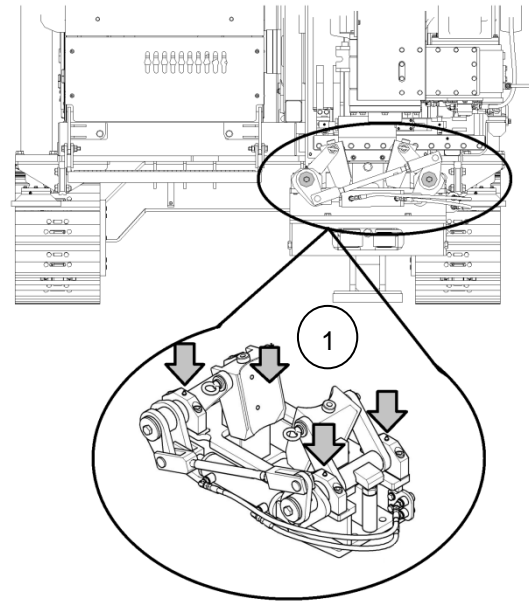
● **Wire pulley (from mast grease injection points)**

- ① Main winch wire pulley (2 places)
- ② Wireline winch wire pulley (2 place)



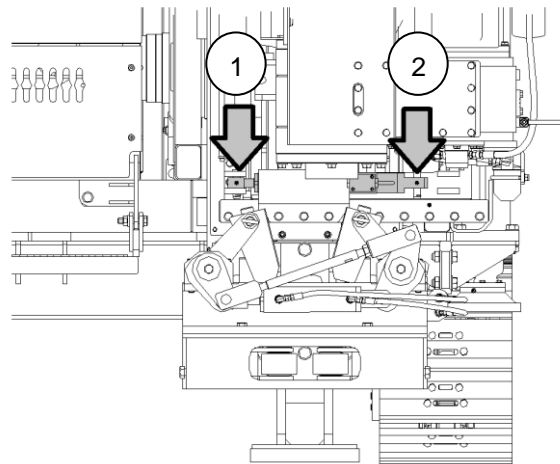
- **Link on foot clamp**

- ① Link on foot clamp (4 places)



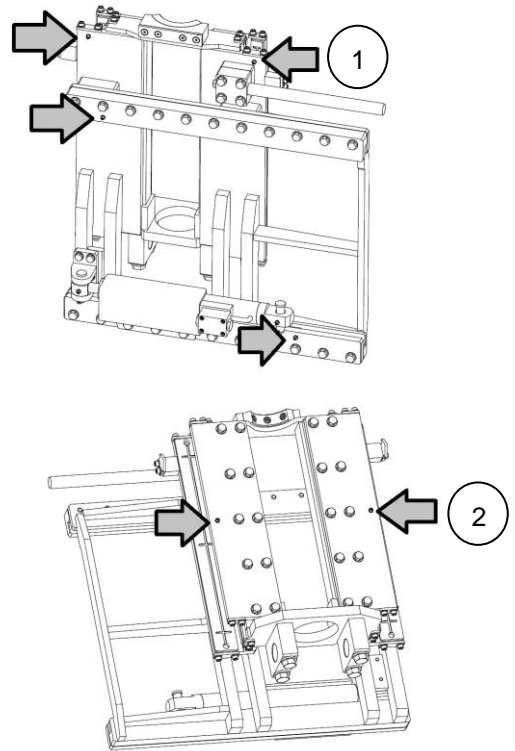
- **Side shift cylinder**

- ① Side lift cylinder (right) (1 place)
- ② Side lift cylinder (left) (1 place)



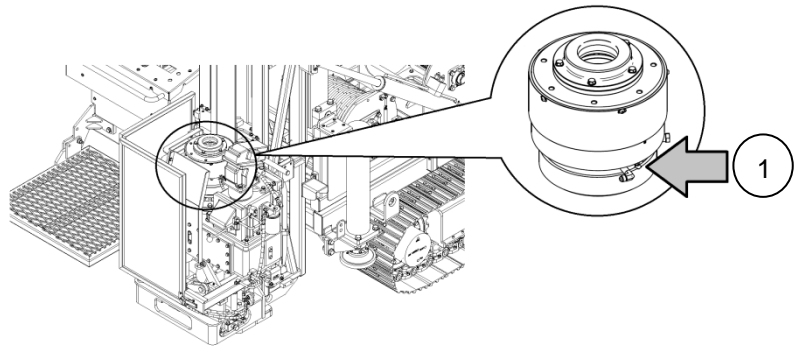
- **Rotary head cradle**

- ① Front side on cradle (4 places)
- ② Rear side on cradle (2 places)



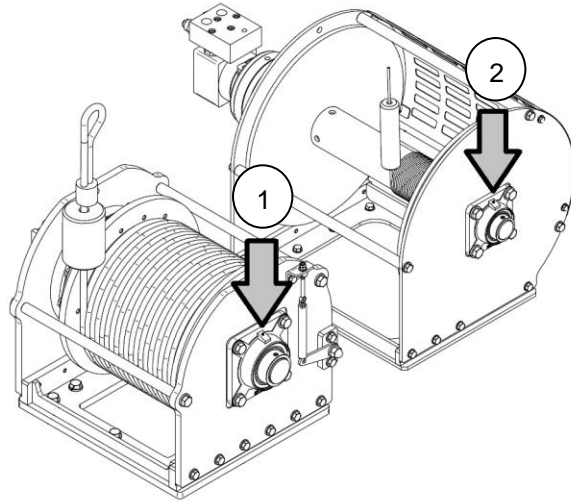
- **Chuck**

- ① Chuck (1 place)



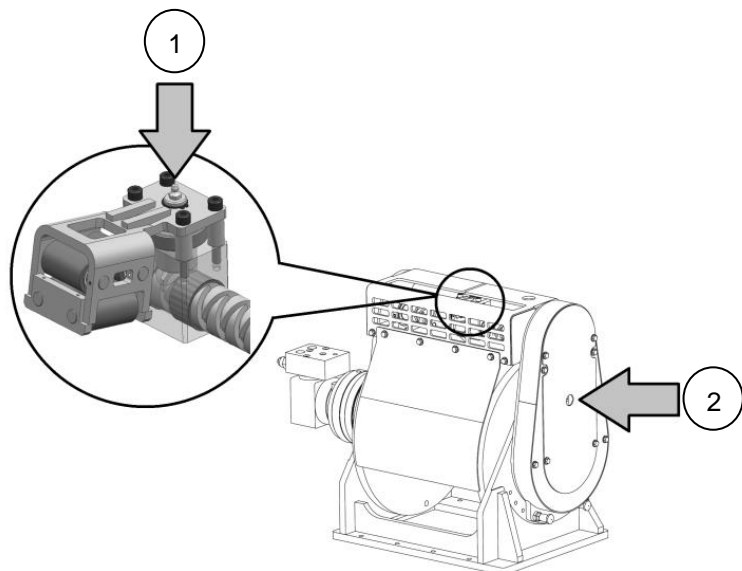
● **Wire line winches (Standard)**

- ① Outrigger pad (4 places)



● **Level winder (Option)**

- ① Screw bracket (1 place)
- ② Drum (1 place)

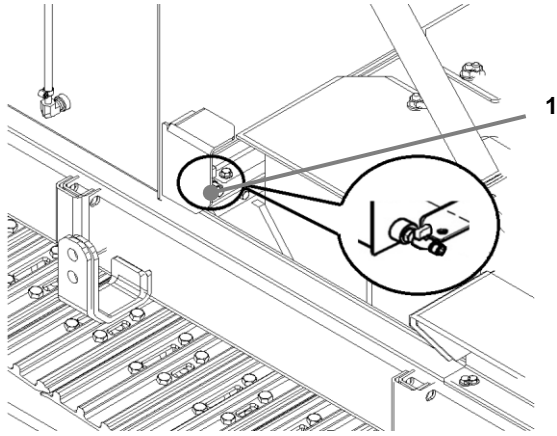


### 4.1.3 Water drain on fuel

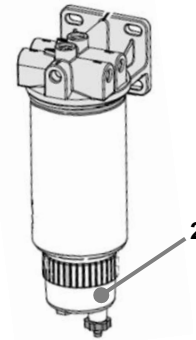


#### IMPORTANT!

Contained water or impurities on fuel will cause serious damages on engine and related parts. It is recommended drain water on the fuel tank and water separator before starting engine.



*Figure: Fuel drain cock*



*Figure: Fuel-Water separator*

*Table: Water drain on fuel*

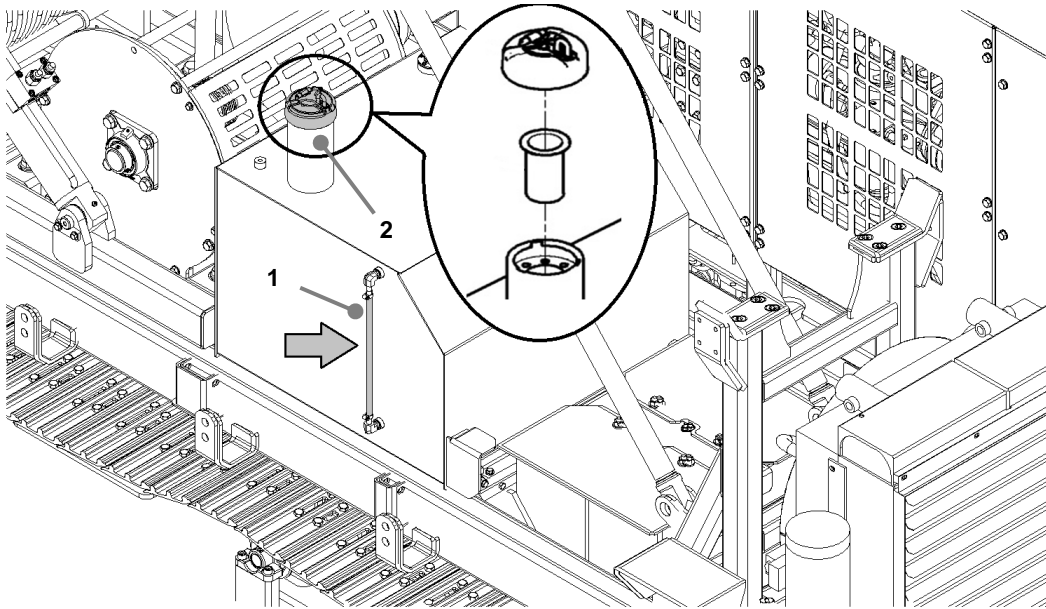
Check point	Parts	Instruction
1	Fuel drain cock	Open drain cock and drain water
2	Fuel-water separator	Open drain cock and drain water

#### 4.1.4 Fuel level check



#### **WARNING!**

The fuel is flammable. Avoid heat, fire and electricity during refilling fuel.  
Stop the engine during refilling fuel.



*Figure: Fuel level check*

*Table: Fuel level check*

Check point	Parts	Instruction
1	Fuel level indicator	Check remained fuel on the tank
2	Fuel cap	Open fuel cap and refill the fuel.



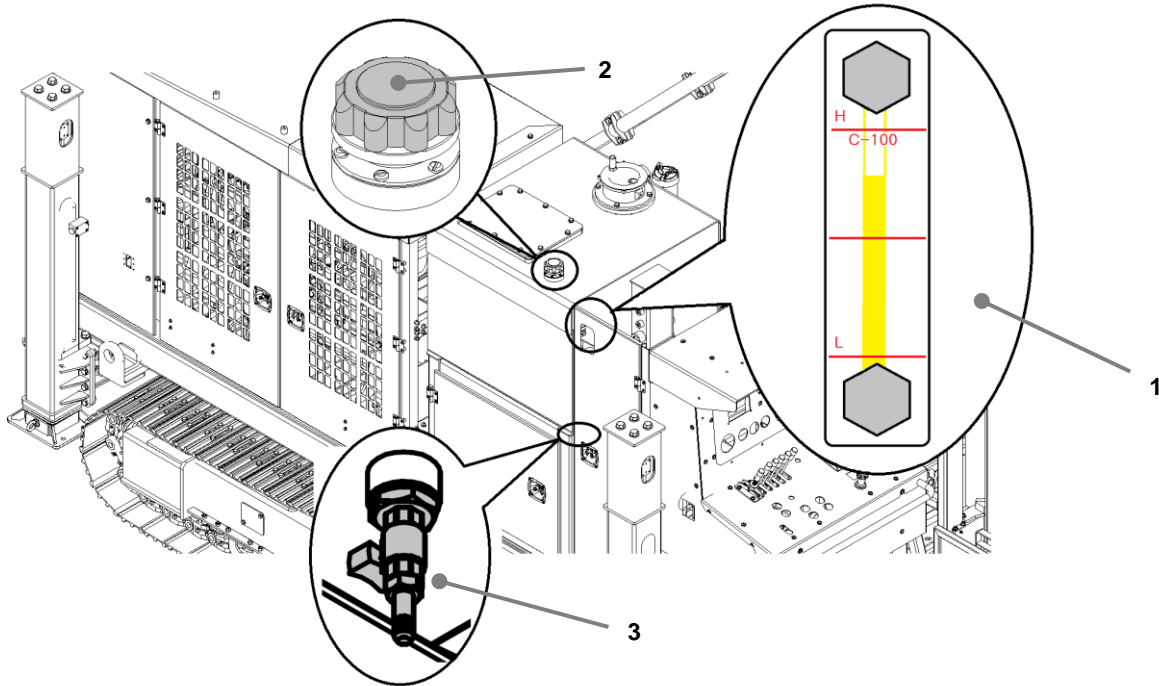
#### 4.1.5 Hydraulic oil level check



#### WARNING!

Do not mix with other type of hydraulic oil.

Check oil contamination and water insertion regularly, and replace hydraulic oil according to maintenance schedule.



*Figure: Hydraulic oil tank*

*Table: Hydraulic oil level check*

Check point	Parts	Instruction
1	Hydraulic oil level gauge	Check remain amount of hydraulic oil, and refill it if required.
2	Hydraulic oil tank cap	Refill hydraulic oil if required.
3	Hydraulic oil drain cock	Drain hydraulic oil if required.

#### 4.1.6 Rotary head lubrication oil



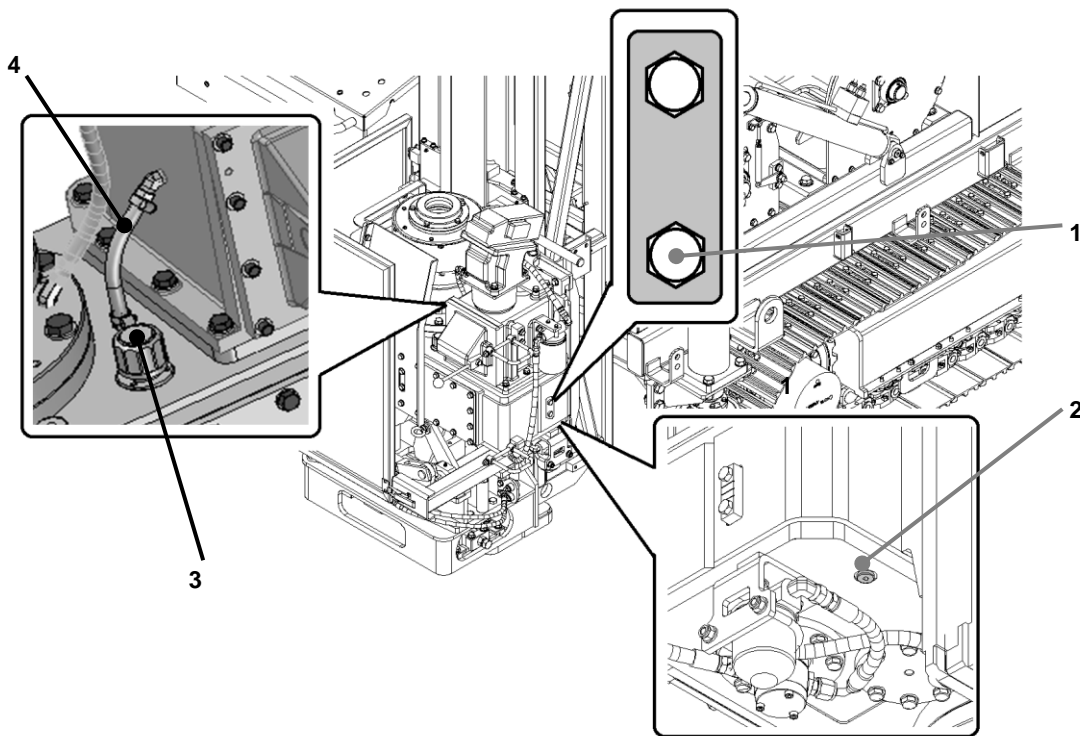
#### WARNING!

Lack of drifter lubrication oil will cause early wear or damage of drifter rotation parts.  
Too much lubrication oil will cause excessive heat on the rotary head.



#### DANGER!

Do not run rotary head while maintenance is performed.



*Figure: Rotary head check points*

*Table: Rotary head check list*

Check point	Parts	Instruction
1	Oil level check plug	Open plug and check if oil comes out from the hole. A little oil comes out from the hole, it is OK to operate.
2	Oil drain plug	If too much oil is existed in the gear box, drain oil by opening drain plug
3	Oil circulation check hose	When rotary head is operated, check the oil condition which is circulated correctly.
4	Oil refill cap	If oil is not filled sufficiently on the rotary head, open the cap and fill the lubrication oil.

#### 4.1.7 Electric device check



#### **DANGER!**

Gas from battery may be explosive.

When liquid of battery is contacted with skin or eye, clean it immediately with clean water, and consult with doctor.

Do not touch electric devices with bare hands. Turn off master switch before repairing.

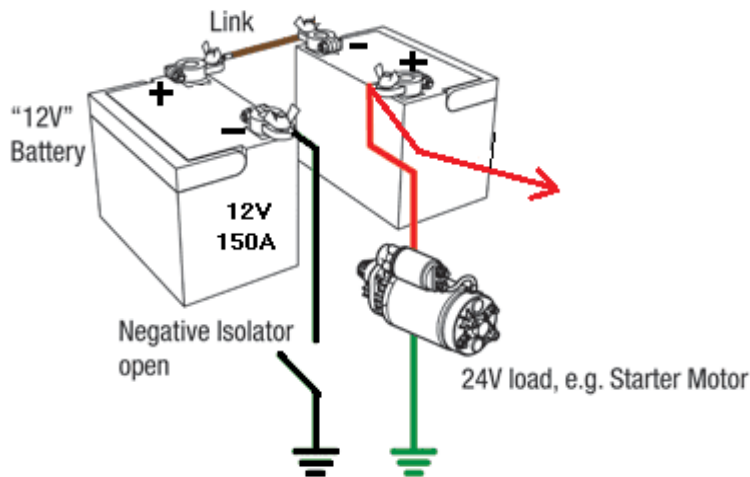


#### **WARNING!**

Before welding, turn off master switch and disconnect battery. Exposing high voltage may burn electric lines and devices.

If abnormal condition is noticed during checking procedure, shut off main switch and repair failed parts for safe operation.

#### ● Battery check

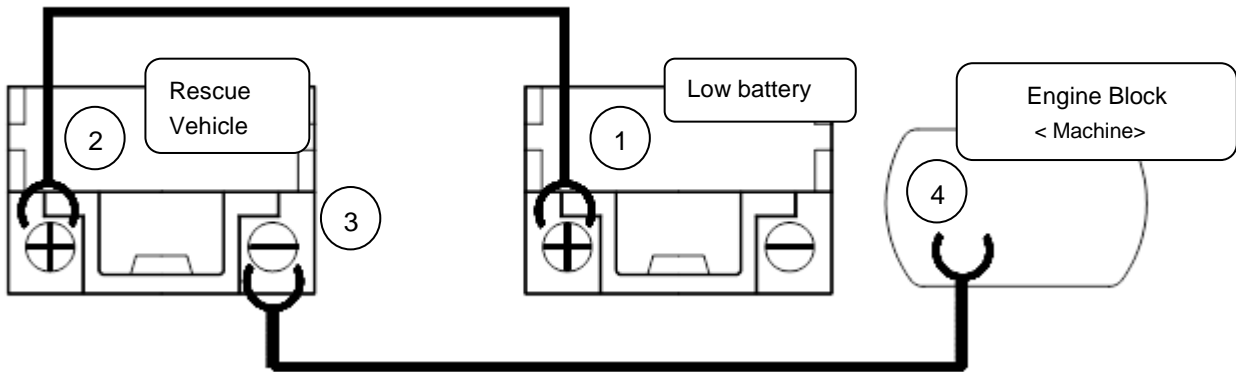


*Figure: Battery connection*

*Table: Indicator on battery*

Indicator	Condition	Check point
	Normal	OK to use
	Need to charge	Low battery. Charging is required. If indicator shows 'black' after recharging, replace battery.
	Need to replace	Replace battery with new one

● Battery recharge procedure



*Figure: Battery connection for recharging*

- \* Electric cable connection order (for recharging battery) : ① → ② → ③ → ④
- \* Electric cable disconnection order (after recharging) : ④ → ③ → ② → ①

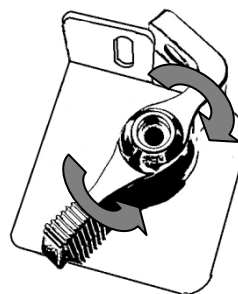
*Table: Main control panel*

Check point	Parts	Instruction
-	Electric cables	Check if electric cables are loosen or damaged Plastic cover damage
-	Electric connection port on battery	Check if connections are loose or rusted.

● Turn on electric system



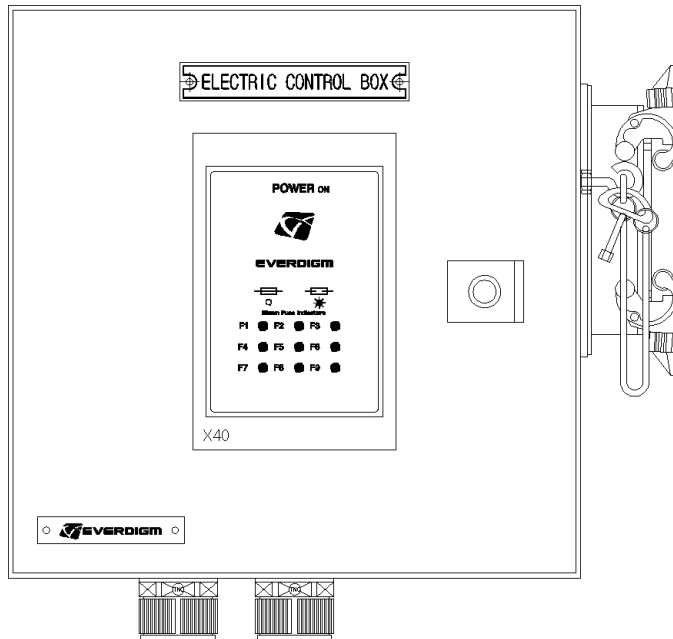
*Figure: Engine starter switch*



*Figure : Master switch (2 places)*

- ① Turn on master switches in bonnet
- ② Turn engine starter key to "ON" position

● Main control panel

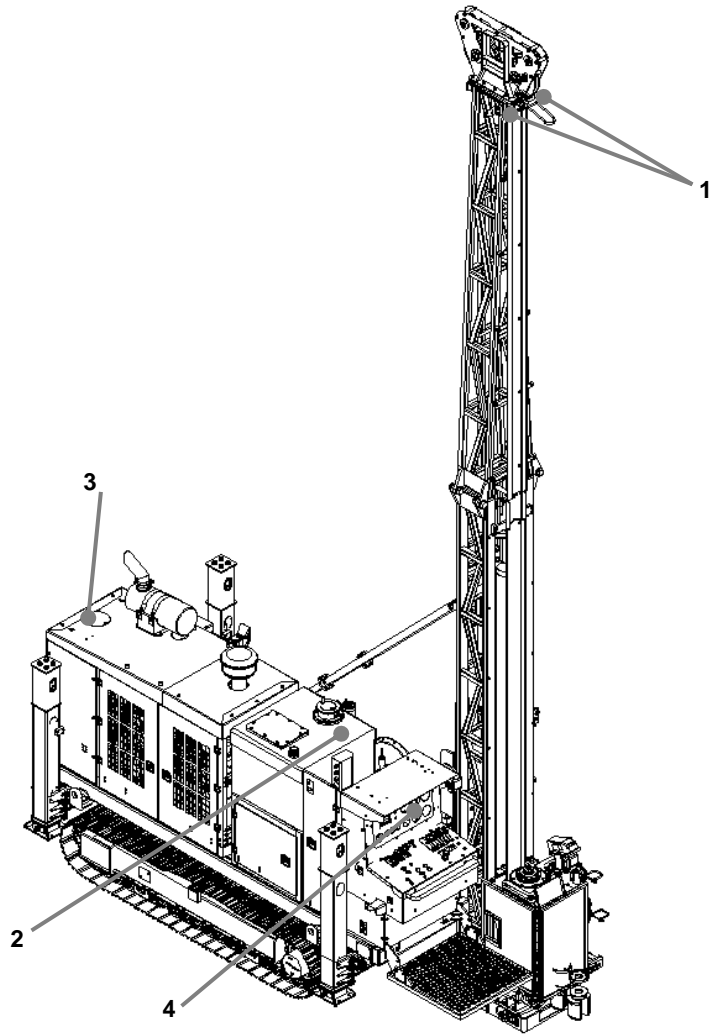


*Figure: Main control panel*

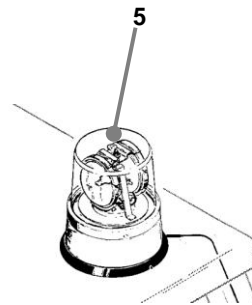
*Table: Main control panel*

Check point	Parts	Instruction
-	Main control panel	Check if fuse or relay lamp is ON. If lamp is ON, replace fuse or relay.
-	Electric connection	Check electric cables and connector whether it is damaged or rusted.

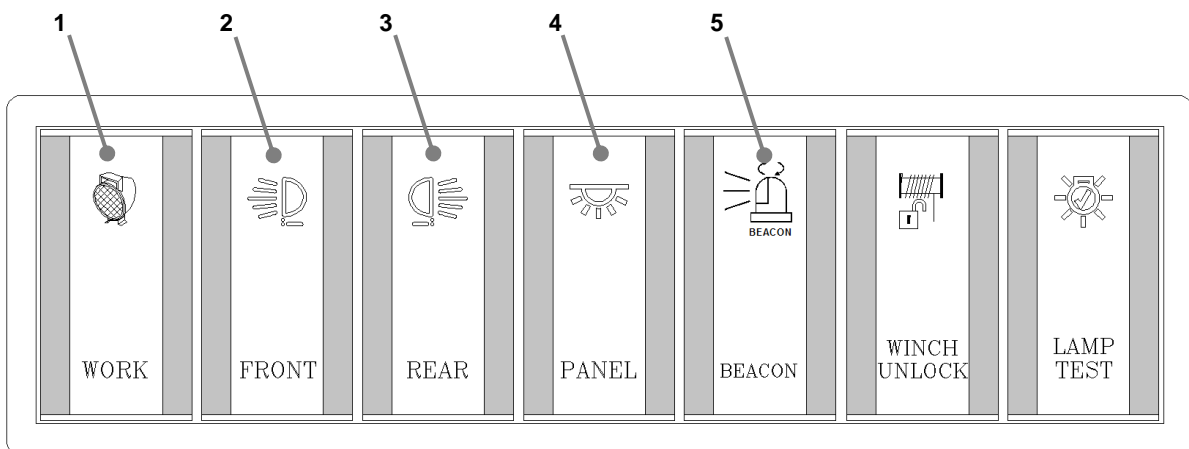
● Working lights and rotating beacon



*Figure: Work lights*





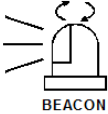


*Figure : Rotating beacon*



*Figure: Lights and Rotating beacon control switch*

Table: Working lights and rotating beacon

Symbol	Parts	Instruction
	1. Working light (Mast, 4 pcs)	Push working light switch and check lamp if lights are ON.
	2. Working light (Front, 1 pc)	Push working light switch and check lamp if lights are ON.
	3. Working light (Rear, 1 pc)	Push working light switch and check lamp if lights are ON.
	4. Working light (Panel, 1 pc)	Push working light switch and check lamp if lights are ON.
 BEACON	Rotating beacon (Rear, 1 pc)	Push rotating beacon switch and check lamp if lights are ON.

● Lamp test

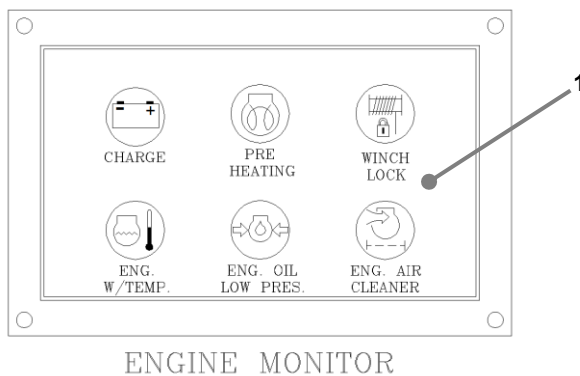


Figure: Diagnostic lamp

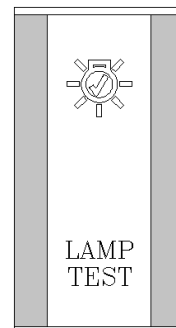
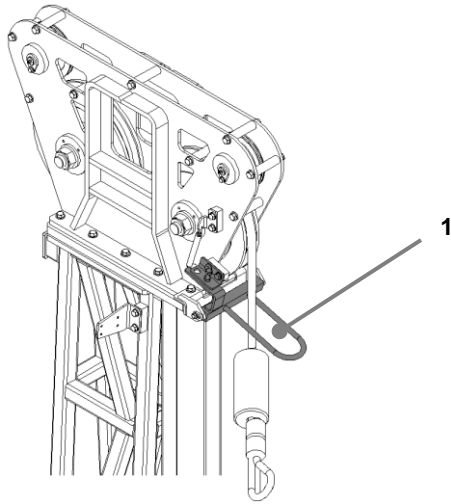


Figure : Lamp test

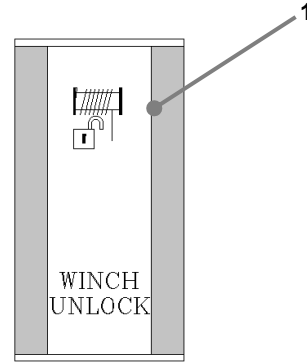
Table: Lamp test

Check point	Parts	Instruction
1	Lamp test and diagnostic lamp	Push lamp test switch and check all diagnostic lamps are ON.

● Winch unlock switch



*Figure: Upper hoist limit*

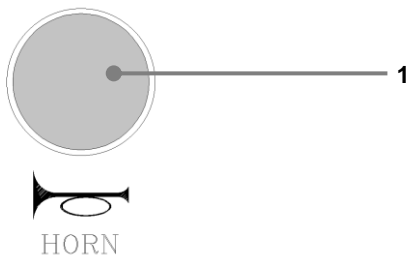


*Figure : Winch unlock switch*

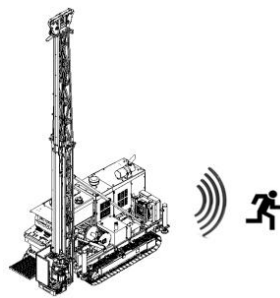
*Table: Lamp test*

Check point	Parts	Instruction
1	Upper hoist limit	When main line wire weight hits the upper hoist limit, the main line winch is stopped automatically.
2	Winch unlock switch	When upper hoist limit sensor is activated, this switch enable to operate main wireline winch.

● Horn switch



*Figure: Horn switch*



*Table: Horn switch*

Check point	Parts	Instruction
1	Horn switch	Push horn switch and check sound if it is enough loud to alert to others.



## 4.2. Engine start

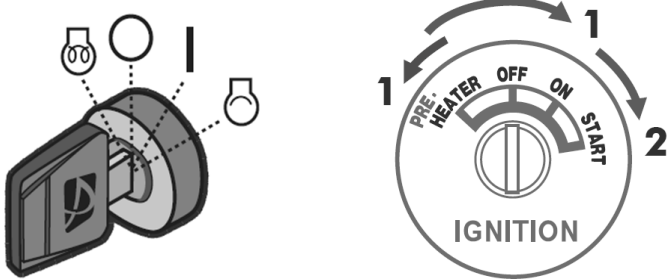


### WARNING!

Check inner side of bonnet before starting engine. Tools and any other objects on the engine room may cause serious damage.

Alert to others before starting engine.

### 4.2.1 Starting engine

Engine type	Instruction	
<b>Starter key configuration</b>		
<b>15°C or above (ambient temperature)</b>	<b>Turn starter key and hold for 3 seconds "ON" position. Start engine and release key after starting</b>	
<b>0°C or below (ambient temperature)</b>	<b>Hold starter key "ON" position for 10 seconds before starting engine.</b>	<b>Hold starter key "PREHEATER" position for 10 seconds before starting engine.</b>

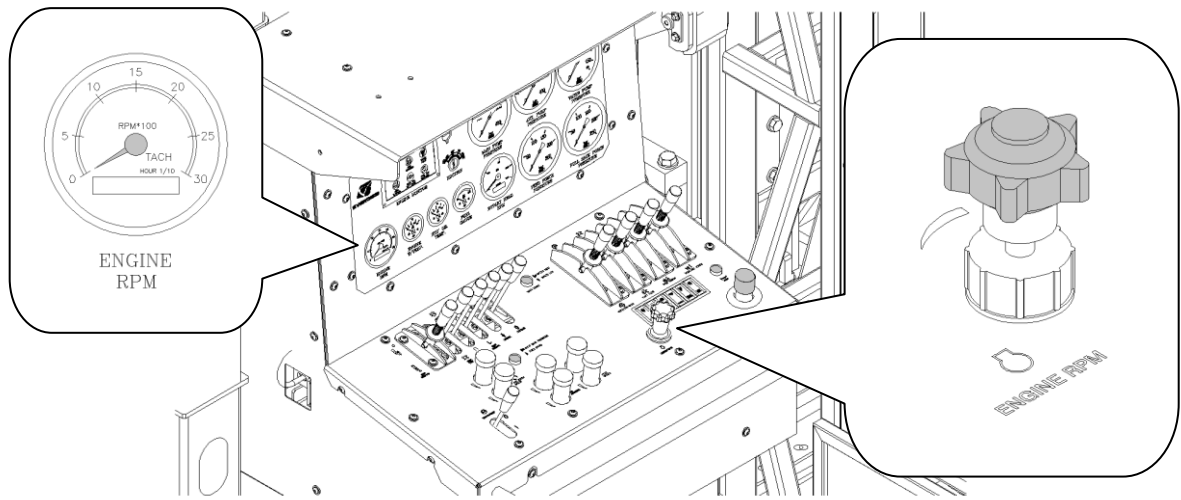


### IMPORTANT!

Do not set high engine RPM immediately after starting engine. Warming up the engine and equipment properly before operation.

- Warm up the equipment and engine with idle rpm at least 3 minutes before operation.
- Check equipment condition after starting engine.
- When abnormal engine condition is noticed, contact local engine distributor for more support.


● RPM Throttle control



*Figure: RPM throttle switch*

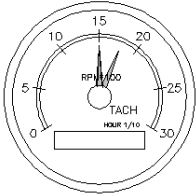
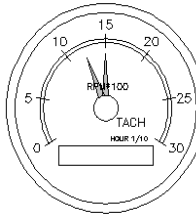
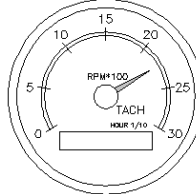
According to working condition of drill rig, the engine rpm can be controlled and adjusted by rotating switch.

*Table: RPM throttle control switch and max. rpm mode selection switch*

Symbol	Description	Engine rpm range (rpm)
	Engine RPM Throttle control switch	1,000 (Idle) ~ 2,200 (Max)
ENGINE RPM	Engine RPM tachometer	It shows current running engine rpm. Also, engine hour is indicated on this tachometer.

For the efficient work, the following is reference for optimal operation. Operator may set engine RPM manually according to working condition.

*Table: Proper engine RPM range for operation*

Operation	Proper RPM Range	Remarks
Traveling	 <p>1500 ~ 1700</p>	Increase engine RPM when more torque and speed is required
Mast positioning	 <p>1300~1500</p>	Adjust engine RPM for precise movement.
Drilling	 <p>2200</p>	According to pipe size, adjust the engine rpm with optimal bit rotation speed.

## 4.2.2 Emergency switches

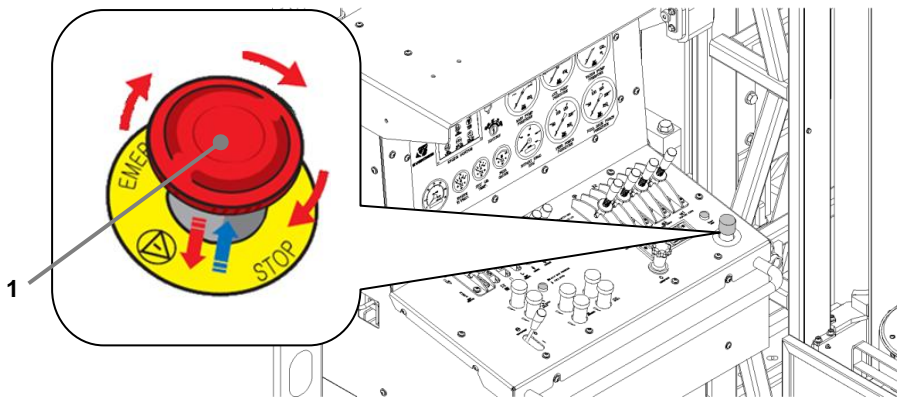


### IMPORTANT!

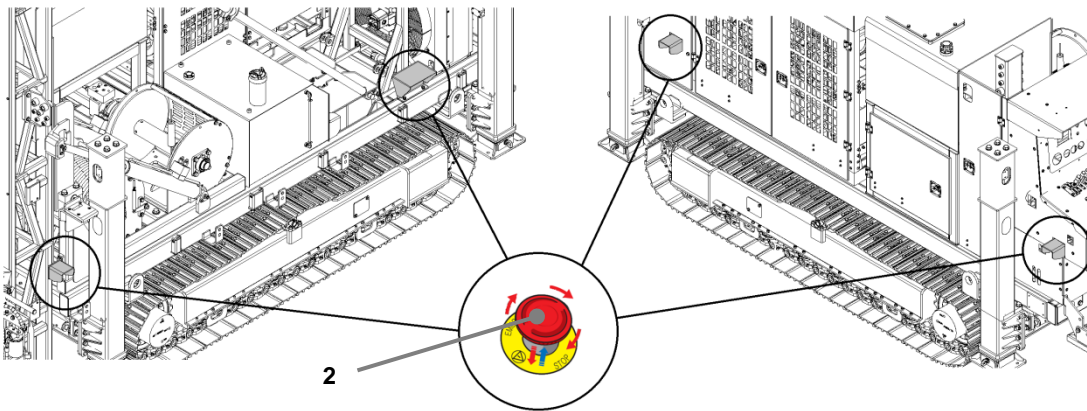
Emergency switches should be checked regularly. When danger situation is noticed, stop the machine immediately.

When engine would not run, check emergency switches if it is activated.

#### ● Emergency switch on control panel



*Figure: Emergency switch on the control panel*



*Figure: Emergency switch on side bonnet (4 places)*

*Table: Emergency switches*

Check point	Parts	Instruction
1 & 2	Emergency button push	Push button and check if engine is stopped.
1 & 2	Emergency button turn	Turn button and check if engine starts normally.

### 4.3. Engine stop and parking

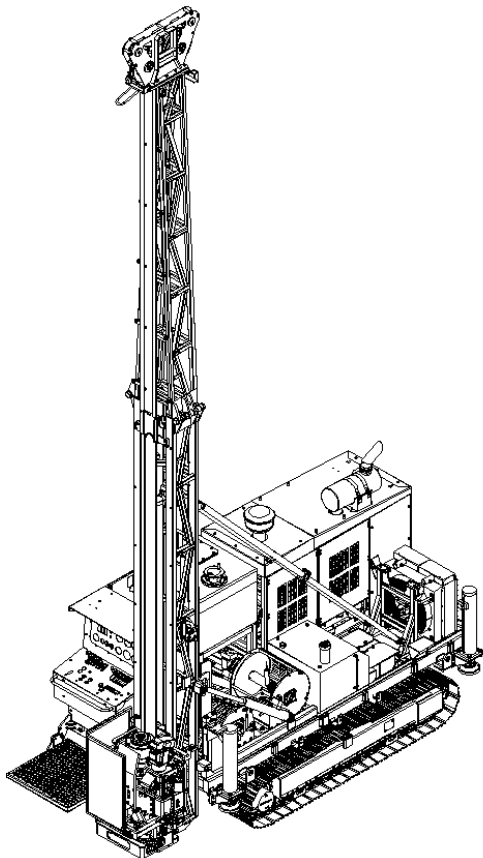


#### IMPORTANT!

Do not stop engine when it has high RPM.

Before stop the engine, set idle RPM for 30 seconds. Sudden engine stop on high RPM will cause engine failure or damages.

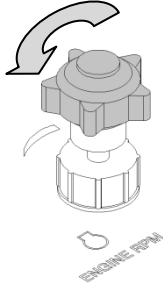
#### 4.3.1 Parking



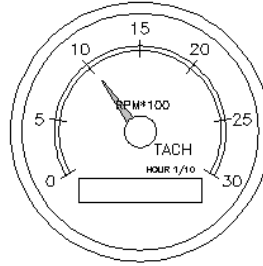
*Figure: Parking posture of machine*

- ① Place machine on the safe, firm and even ground. Do not put the machine on slope.
- ② Put the mast on firm ground with vertical position.

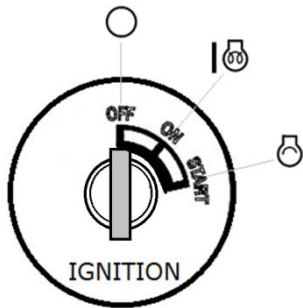
### 4.3.2 Engine stop



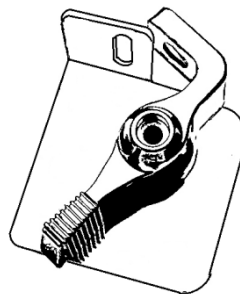
*Figure: RPM throttle lever*



*Figure : Idle engine RPM*



*Figure: Engine starter switch*



*Figure : Master switch*

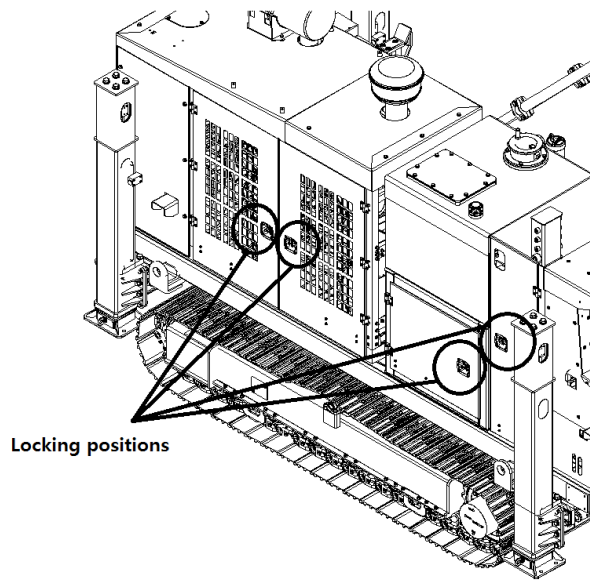
- ① Set the engine RPM to idle mode (1000 rpm), and wait for 30 seconds
- ② Turn off all switches and set the levers to neutral position in the cabin
- ③ Turn engine starter key to "OFF" position
- ④ Turn off master switch in bonnet (O : off, I : on)



#### **IMPORTANT!**

Do not stop the engine in high engine RPM except emergency. Before stopping engine, set idle rpm for 30 seconds.

### 4.3.3 Locking the machine



*Figure: Locking on machine*

*Table: Locking positions*

Check point	Parts	Instruction
-	Bonnet locking	Lock the doors.

## 4.4. Traveling



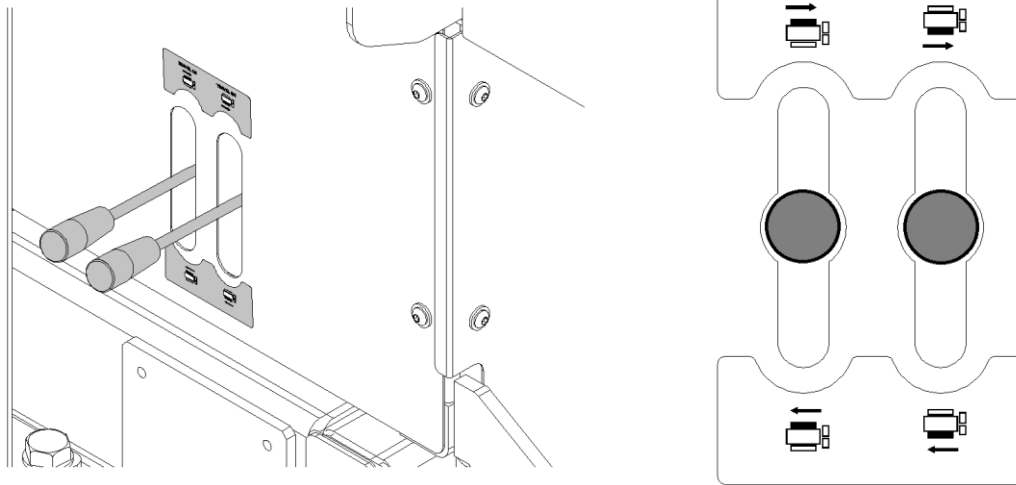
### DANGER!

Do not allow others to approach to the machine while it is traveling.

Pay attention on ground condition while it is moving. Do not attempt to move the machine where danger situation is predicted.

Pay special attention to your feet while machine is moving.

### 4.4.1 Travel control



*Figure: Travel lever*

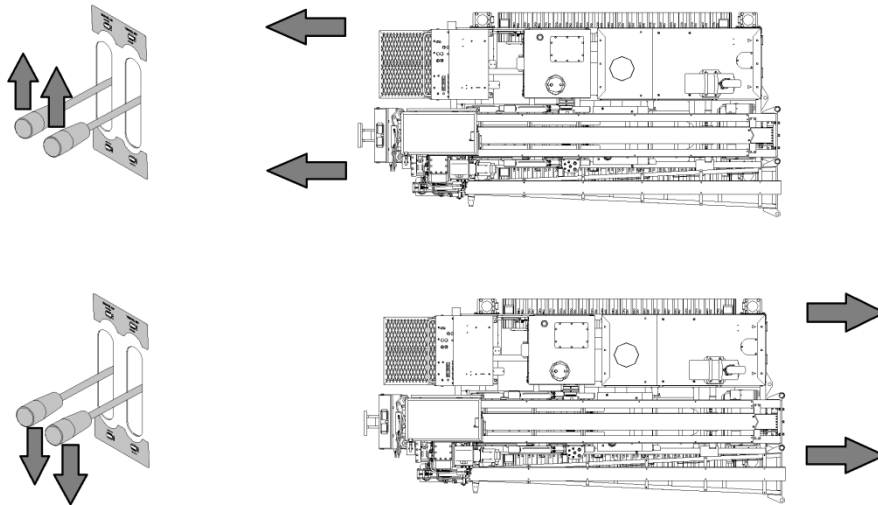
Travel lever has proportional control which means the travel motor speed can be adjusted according to how much lever is pushed or pulled.

The travel speed can be increased or decreased by engine RPM settings.

Symbol	Parts	Instruction
<b>TRAVEL RH</b> 	Travel control lever (Right, Forward)	Right track forward movement
	Travel control lever (Right, Backward)	Right track backward movement
<b>TRAVEL LH</b> 	Travel control lever (Left, Forward)	Left track forward movement
	Travel control lever (Left, Backward)	Left track backward movement



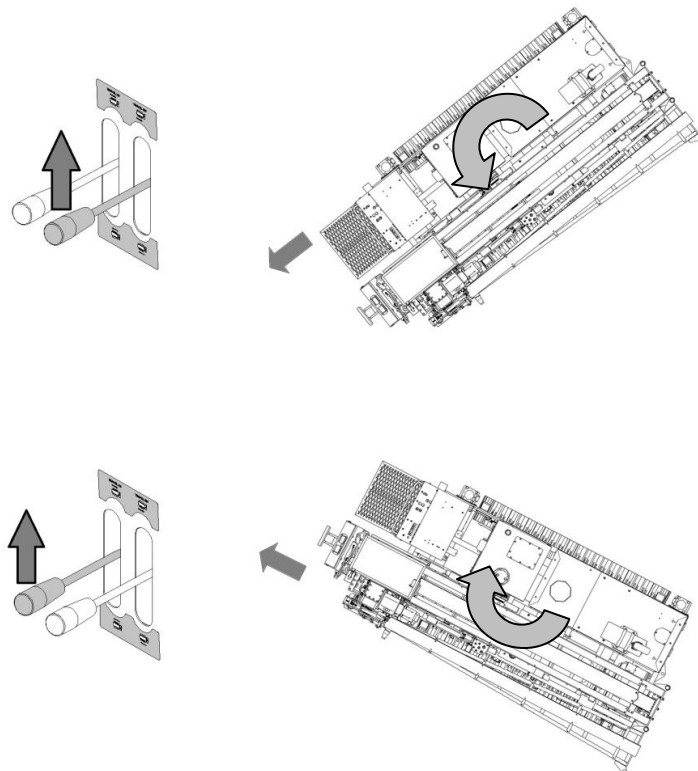
● **Forward and backward movement**



*Figure: Forward and backward movement*

Pull up or pull down both travel levers (L and R) for moving the machine to forward or backward.

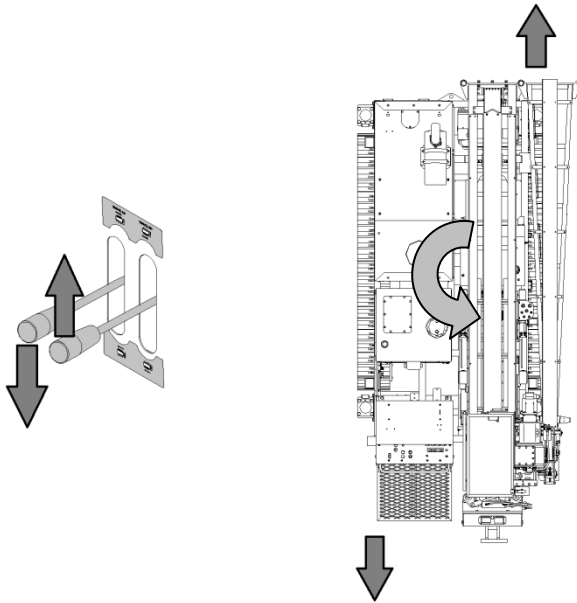
● **Left and right turn**



*Figure: Left or right turn*

Pull up or pull down one lever (L or R) for turning the machine.

● Spin turn



*Figure: Spin turn*

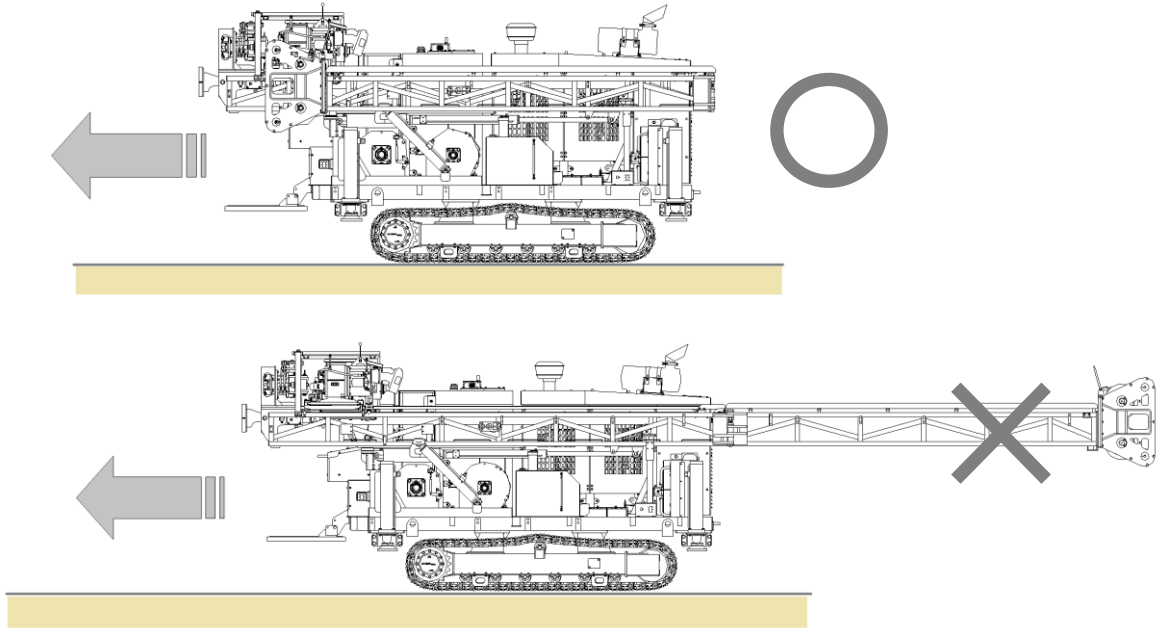
Machine can make sharp turn in the arrow area by pushing or pulling the levers (L and R) to opposite sides.

#### 4.4.2 Correct posture for moving equipment

- **Machine posture before moving**

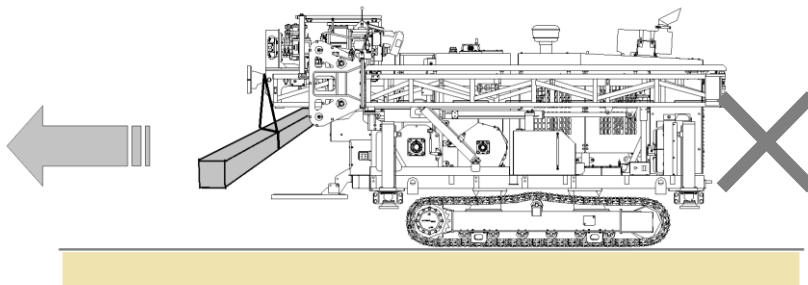
Fold upper mast with lower mast and put the mast on the supporter firmly. Mast and related parts should not move freely on uneven ground while machine is traveling.

Check ground condition where the machine will move.



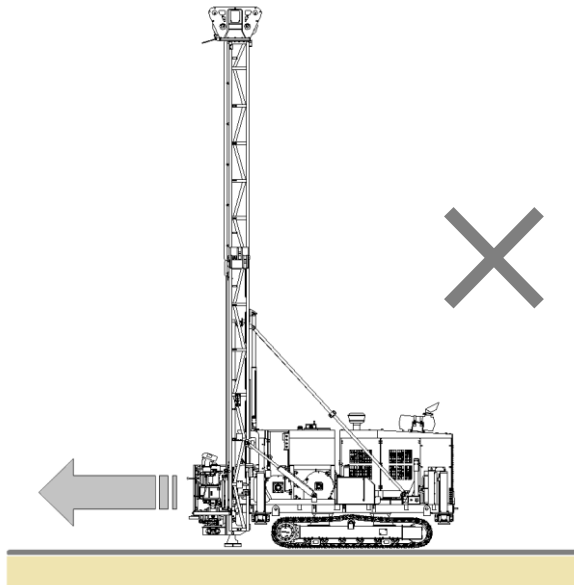
- **Do not carry heavy object with machine**

Carrying heavy objects will break down the balance of machine, and cause damage or deformation of components.



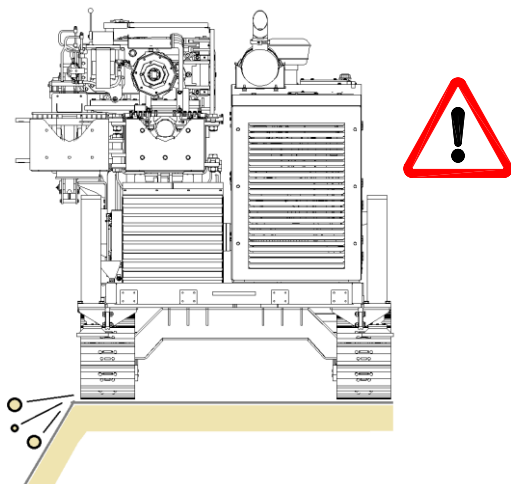
- **Do not move machine with mast in the air while traveling**

External shock or bending stress will cause damage to the machine.



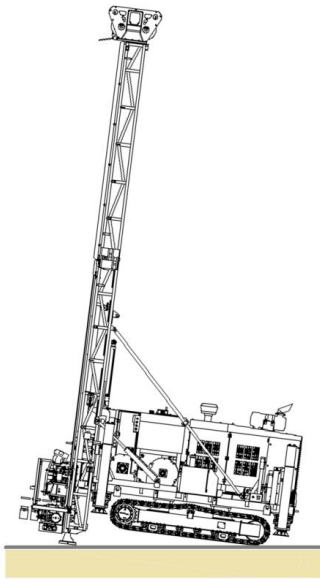
- **Pay special attention while traveling narrow area**

The slope and ground may not be strong enough to support machine. Check track location while driving narrow area.

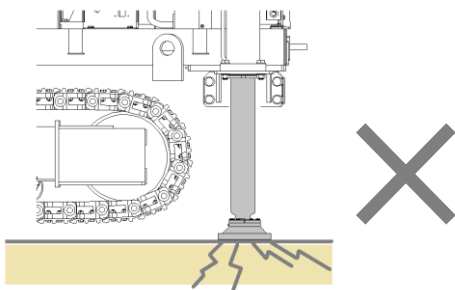
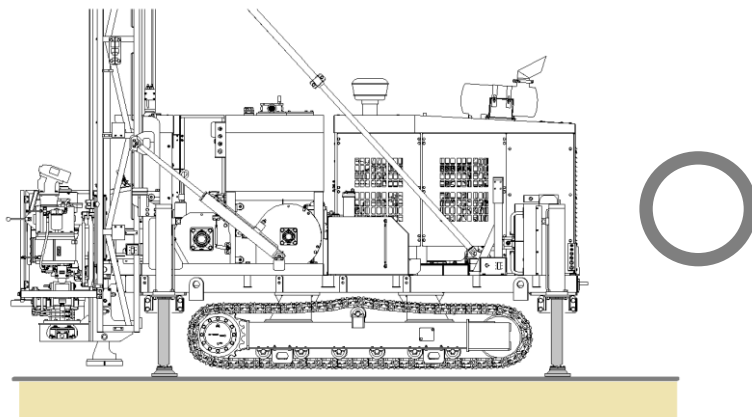


● **During operation**

Do not support machine or press mast with excessive force. It will cause damages to the machine.



The machine should be securely supported with 4 outriggers during operation. The outriggers should be settled on the strong and firm ground.



## 4.5. Controller and switches



### DANGER!

Do not allow others to approach to the machine while it is operating.

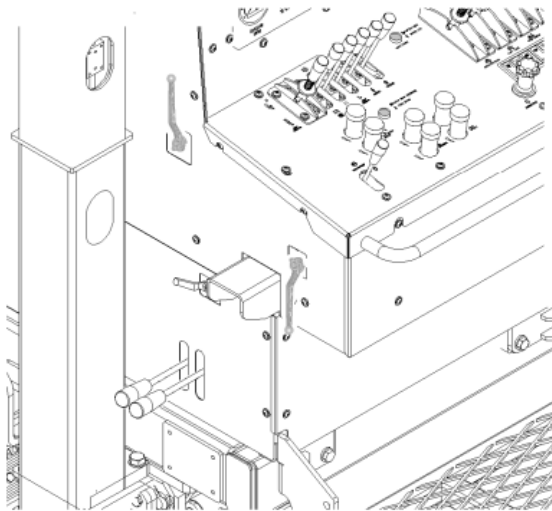
Wear ear plug, safety helmet, mask and safety glass for your safety. High noise during drilling can hurt your hearing, and rock powder will be very harmful to your health.

Pay attention to the moving parts. It may hit machine or other objects.

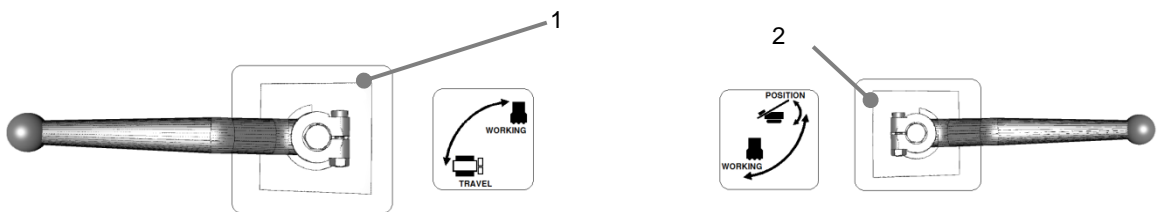
### 4.5.1 Before operation

- Check work mode selection levers

Check work mode by lever location.

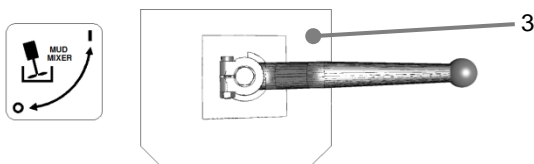


*Figure: Work mode selection levers, and mud mixer ON / OFF lever*



*Figure: Travel and drilling mode selection levers*

*Figure: Positioning and drilling mode selection levers*



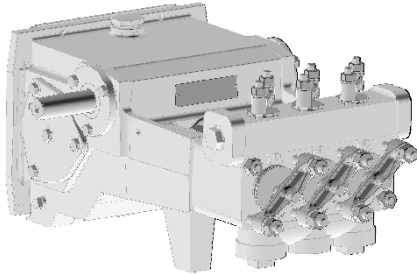
*Figure: Mud mixer ON / OFF lever*

Table: Work mode selection levers, and mud mixer ON / OFF lever

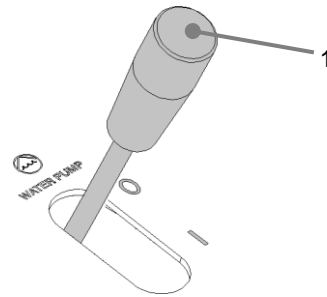
Check point	Parts	Instruction
1	Travel and drilling mode selection levers	<p>Drilling mode and travel mode selector lever:</p> <p>Drilling mode : Rotary head, Feed, Main winch, Wireline winch</p> <p>Travel mode : Travel motors</p> <p>When one of the two modes is selected, the other one is disabled.</p>
2	Positioning and drilling mode selection levers	<p>Drilling mode and positioning mode selector lever:</p> <p>Drilling mode : Water pump, Mud mixer</p> <p>Positioning mode : Mast raise, mast dump, outrigger</p> <p>When one of the two modes is selected, the other one is disabled.</p>
3	Mud mixer ON / OFF lever	Mud mixer operating switch

● **Water pump and mud mixer**

Check water pump and mud mixer operating condition.



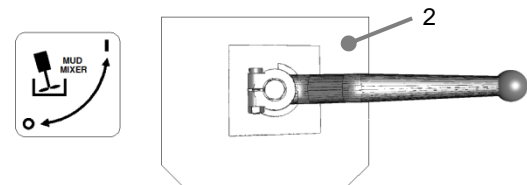
*Figure: Water pump (Option)*



*Figure: Water pump operating switch*



*Figure: Mud mixer (Option)*



*Figure: Mud mixer operating lever*

*Table: Water pump and mud mixer check*

Check point	Parts	Instruction
1	Water pump	Turn ON the water pump operating lever, and check if water pump is operating correctly.
2	Mud mixer	Turn ON the mud mixer operating lever, and check if water pump is operating correctly.



● **Spin cage or safety guard locking condition check**

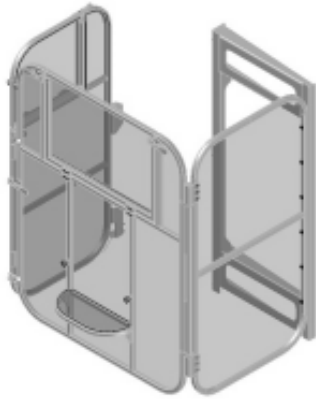


**DANGER!**

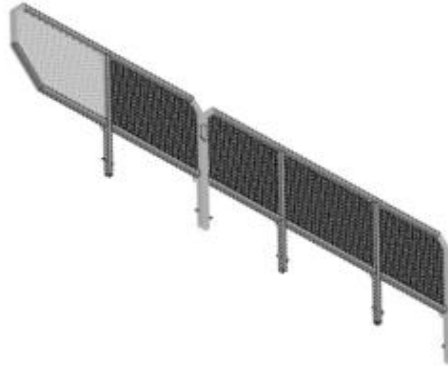
It is very dangerous if someone try to touch rotating parts while it is operating.

Do not allow to enter anybody on the machine during operation.

Close and lock safety devices completely before operation.



*Figure: Spin cage (Option)*



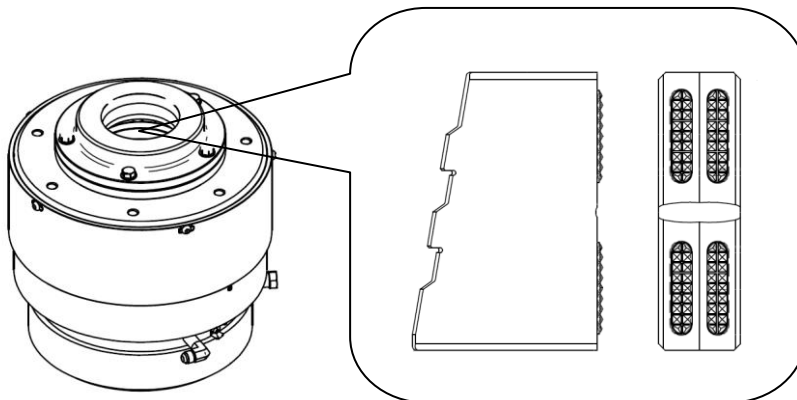
*Figure: Side guard (Option)*

*Table: Safety guard check*

Check point	Parts	Instruction
-	Spin cage Side guard	Check loosening of bolts and parts. Tighten all loosen parts. Close and lock the cage and guard before operation.

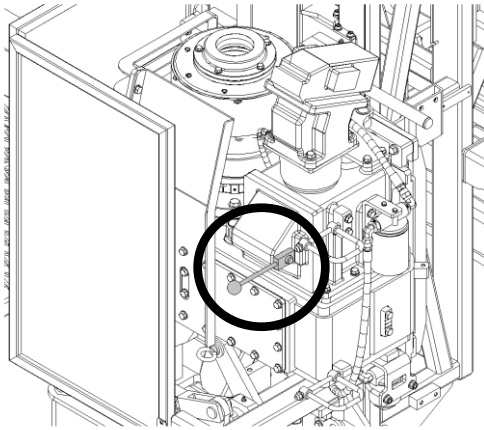
● **Wear of jaw tip check**

Check wear condition of jaw tip inside of chuck before using it. Tips worn out, replace jaw with new one.

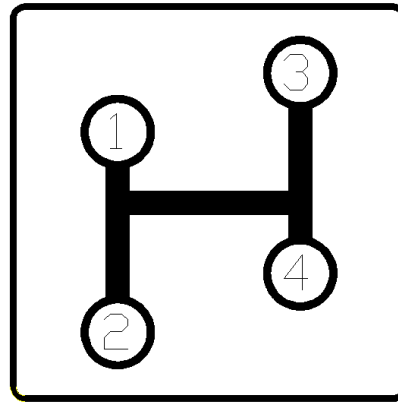


*Figure: Jaw tip inside of chuck*

● **Rotary head transmission gear lever check**



*Figure: Transmission lever*

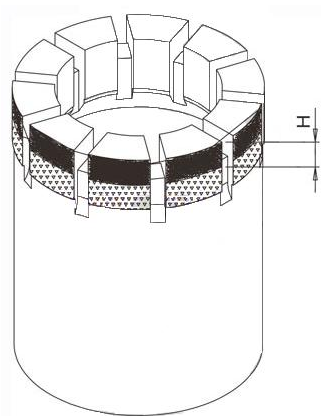


*Figure: Speed mode by transmission*

Check point	Parts	Instruction
-	Transmission gear	Change speed mode by gear and check the rotation speed rpm. Check abnormal noise or sound from transmission.

● **Diamond core bit condition check**

Check wear condition of tip on the bit before using it. Tips or bit are damaged or worn out badly, replace it with new one.



*Figure: Diamond core bit wear check*

- **Wear or damages of steel rope**

Check steel rope condition, and replace it if it is damaged as shown following examples.

**Wire displacement**

Individual wires or wire groups stick out like hairpins on the side facing away from the drum. Wire displacement is caused by spasmodic loads.

Ropes with wire displacement must be scrapped.



*Figure: Example of wire displacement*

**Waviness**

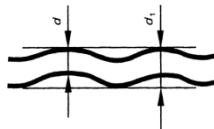
Waviness is a deformation that gives the rope's longitudinal axis a helical curve. Even though wave formation does not necessarily cause weakening of the rope, such a deformation can cause a pulsing movement.

After a long time of operation, this can increase surface wear and wire breaks. In the event of waviness, the rope should be scrapped if

$$d_1 > 4d/3$$

$d$  = Rope's nominal diameter

$d_1$  = Diameter of the circle that would be formed if the rope were not deformed. Check over a length not exceeding  $25d$ .



*Figure: Waviness*

### **Cracks**

Cracks are deformations through outer, violent influences. Ropes with cracks must be scrapped.



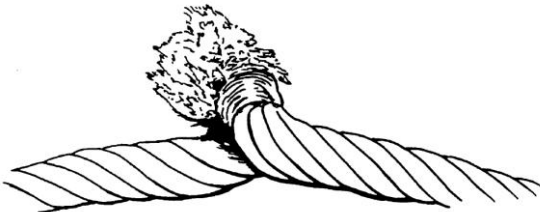
*Figure: Cracks*

### **Kinks**

A kink is a deformation caused by the rope forming an eye that is contracted with out the rope being able to rotate around its own axle.

Strand pitch is altered, which leads a great deal of surface wear and, in severe cases, very low static strength.

Ropes with kinks must be scrapped.



*Figure: Kinks*

### **Flattening**

Flattening is deformation caused by mechanical damage. Ropes with severe flattening must be scrapped.



*Figure: Flattening*

### **Local rope diameter decrease**

Local decrease in rope diameter is often connected to core break.

The area near the end attachments must be inspected especially carefully as it can be difficult to detect rope diameter decrease at these spots.

Ropes with severe rope diameter decrease must be scrapped.



*Figure: Local rope diameter decrease*

### **Local rope diameter increase**

This means repeated thickening of the rope over a long stretch. At the thicker spots, the core pushes out of the rope and causes unevenness of the outer strands.

Ropes with severe rope diameter increase must be scrapped.



*Figure: Local rope diameter increase*

### **Basket formation**

Basket formation occurs on ropes with steel reinforcement or steel core when the outer strand layer becomes longer than the inner strand layer.

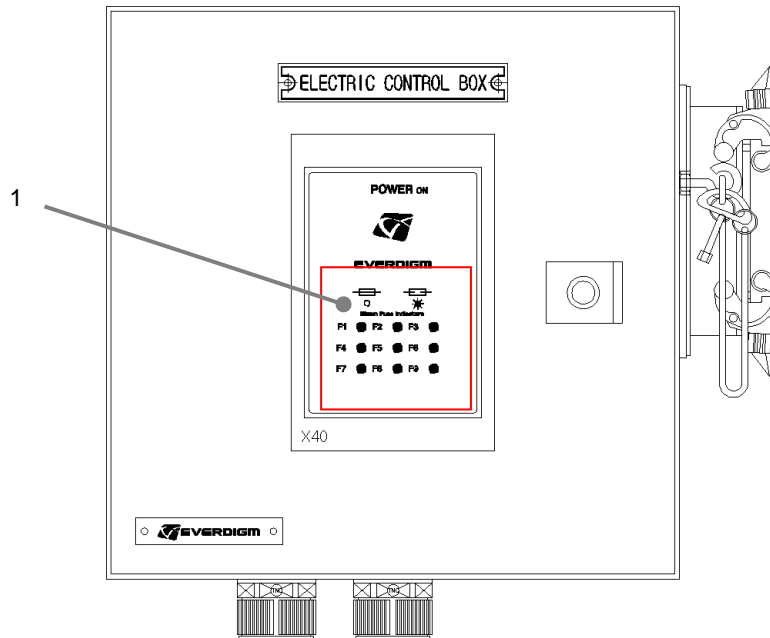
Basket formation can also be caused by shock loads on slack ropes. Ropes with basket formation must be scrapped.



*Figure: Basket formation*

● **Main control panel check**

Open bonnet and check if a fuse is blown. If fuse is disconnected, indicator will be lighted.



*Figure: Main control panel front cover*

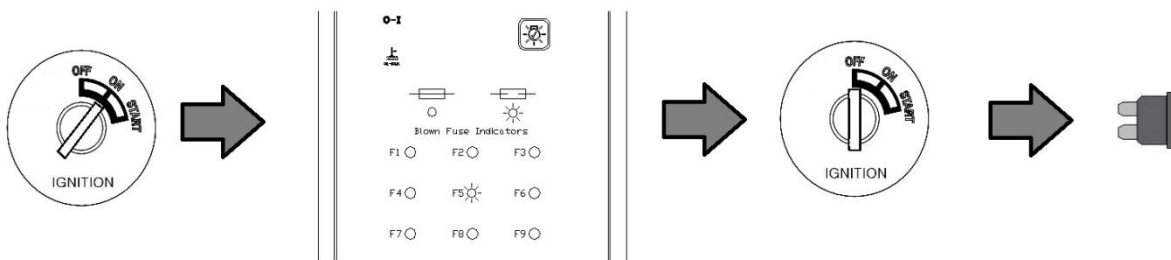
*Table: Main control panel front cover*

Check point	Parts	Instruction
1	Fuse lamp	When light is "ON", the fuse is disconnected.



**IMPORTANT!**

When replace a fuse, use the same capacity fuse unless it will burn electric system or devices. Before changing fuse, turn off starter key switch in the cabin.



*Figure: Fuse check and change procedure*

#### 4.5.2 Main controllers

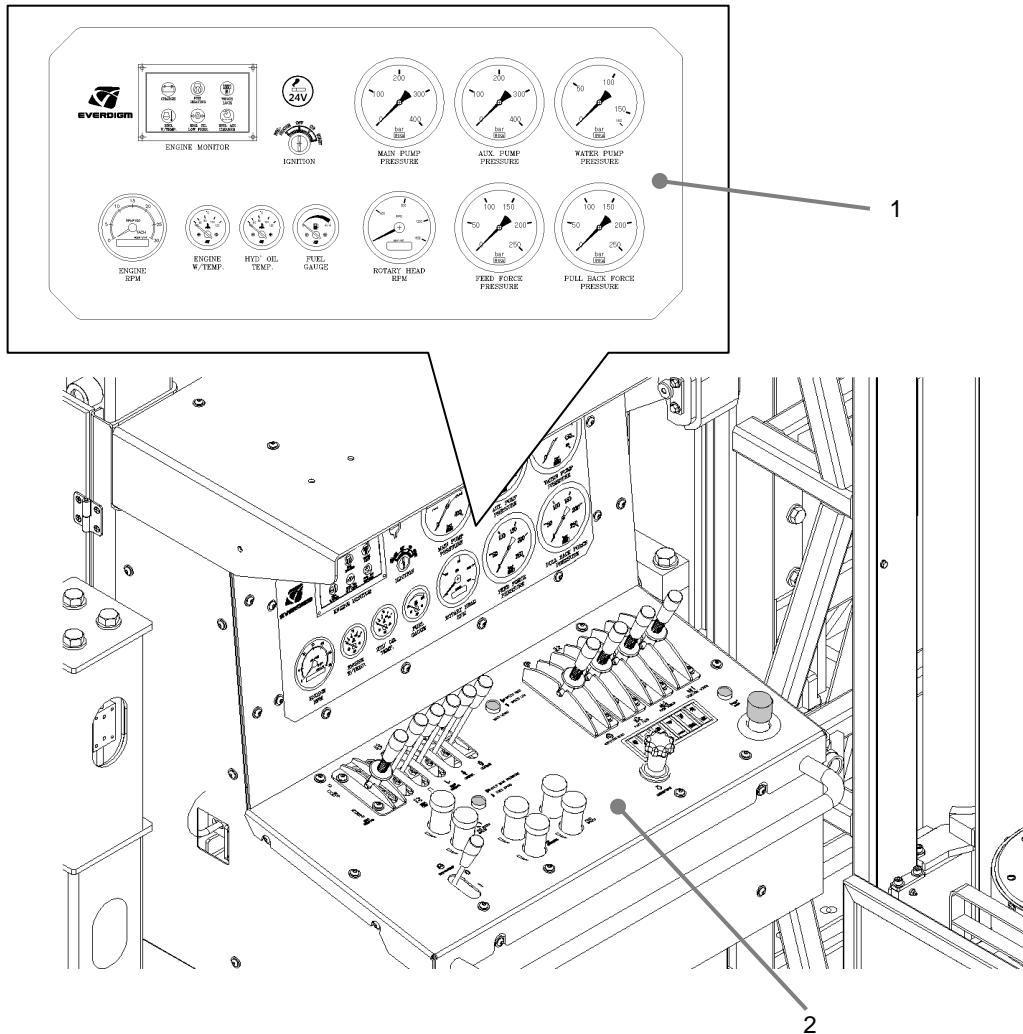


#### WARNING!

Only trained operator can be allowed to operate the machine.

When training for operation is required, contact official Everdigm distributor for assistance.

Mast is very long structure and it may hit other objects during operation. Always observe movement of mast and rotary head while it is operating



*Figure: Main controllers*

*Table: Main controllers*

Check point	Parts	Instruction
1	Gauge panel	Gauges (temperatures, pressures , engine), Ignition and cigar jack.
2	Control panel	Drilling control, pressure adjusters, switches.

#### 4.5.2.1 Gauge panel

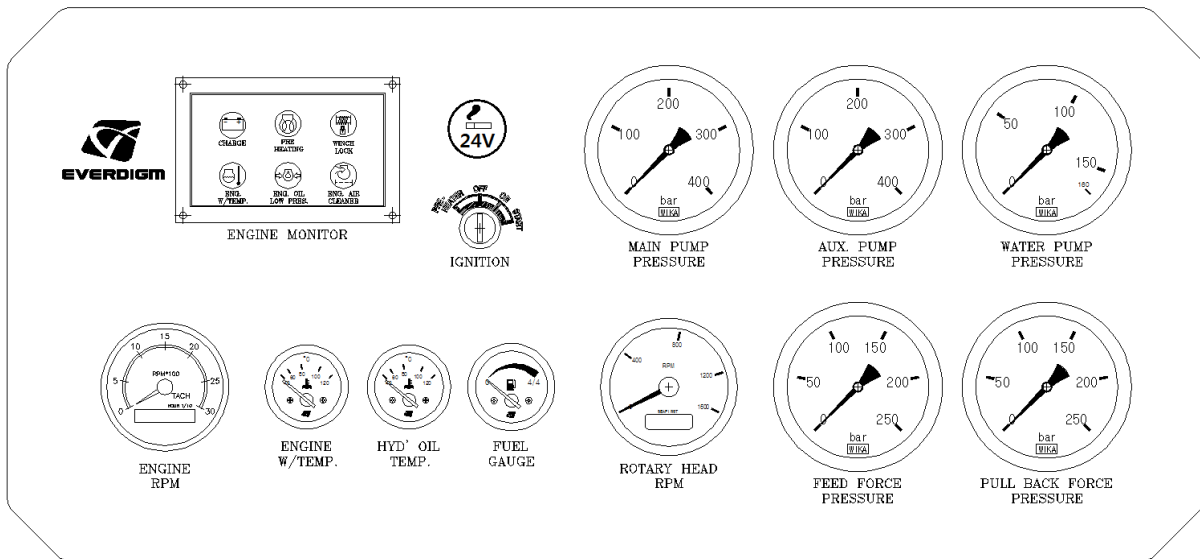


Figure: Gauge panel

Table: Engine monitor









Symbol	Description	Instruction
 CHARGE	Low electricity	Low voltage is detected when it light. Check battery condition.
 PRE HEATING	Engine preheating	Engine preheating is activated.
 WINCH LOCK	Winch lock indicator	Winch lock is activated
 ENG. W/TEMP.	Engine coolant temperature warning	High coolant temperature is detected when it light. Check the coolant temperature.
 ENG. OIL LOW PRES.	Low engine oil pressure warning	Low engine oil pressure is detected when it light. Check engine oil level and condition.
 ENG. AIR CLEANER	Air filter blockage warning	Engine air filter blockage is detected. Check air filter, and clean or replace filter.



Table: Gauge panel

Symbol	Description	Instruction
	Cigar jack	24V D/C output port
	Engine starter	Starting or stop engine with master key.
MAIN PUMP PRESSURE	Main pump pressure gauge	It shows the current main pump (P1) pressure.
AUX. PUMP PRESSURE	Auxiliary pump pressure gauge	It shows the current auxiliary pump (P2) pressure.
WATER PUMP PRESSURE	Water pump pressure gauge	It shows current water pump pressure.
ENGINE RPM	Engine RPM tachometer	It shows current engine rpm with engine hour.
ENGINE W/TEMP.	Engine coolant temperature gauge	It shows current engine coolant temperature.
HYD' OIL TEMP.	Hydraulic oil temperature gauge	It shows the current hydraulic oil temperature.
FUEL GAUGE	Fuel level gauge	It shows remained fuel level on the fuel tank
ROTARY HEAD RPM	Rotary head rpm gauge	It shows the current rotary head rotation speed.
FEED FORCE PRESSURE	Feed force pressure gauge	It shows current feed pressure.
PULL BACK FORCE PRESSURE	Pull back force pressure gauge	It shows the pull back pressure.

### 4.5.2.2 Control panel

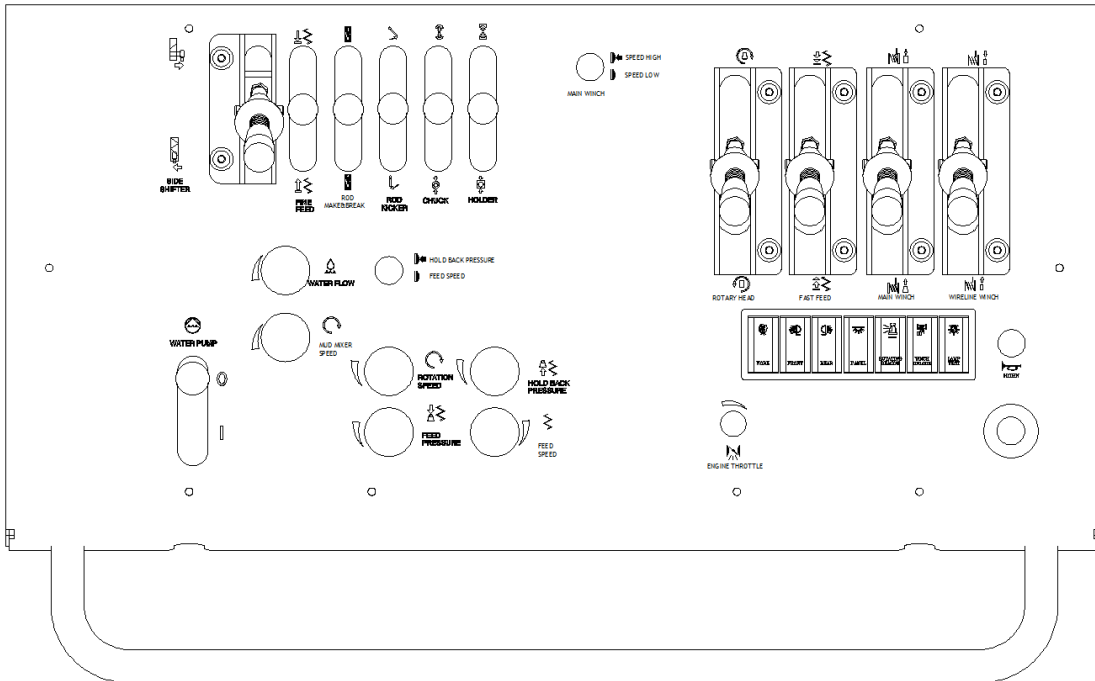









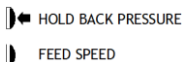










Figure: Main control panel

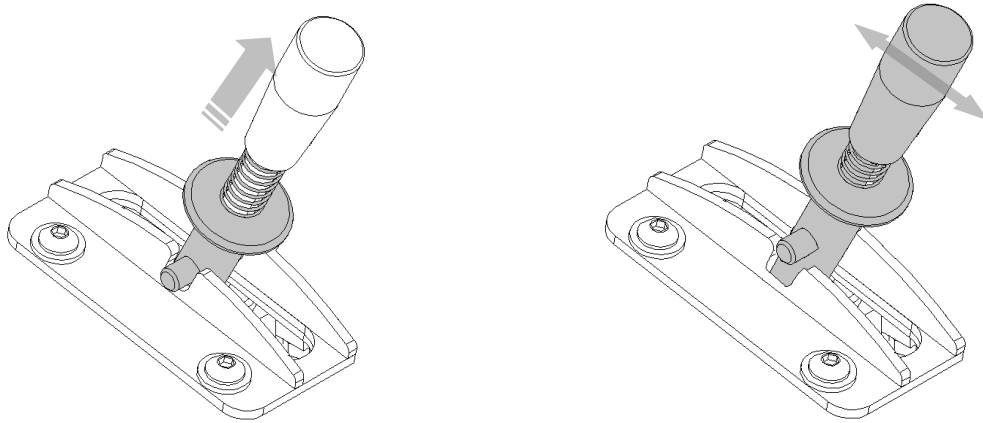
Table: Main control panel

Symbol	Description	Instruction
 SIDE SHIFTER	Rotary head side shift lever	Lever for moving rotary head to each sides.
 FINE FEED	Fine feed operation lever	Lever for fine feed forward and backward movement.
 ROD MAKE&BREAK	Rod make and break lever	Lever for connecting and disconnecting pipe operation.
 ROD KICKER	Rod kicker lever	Lever for rod kicker operation
 CHUCK	Chuck operation lever	Lever for opening and closing chuck to hold pipe
 HOLDER	Foot clamp operation lever	Lever for opening and closing foot clamp to hold pipe

Symbol	Description	Instruction
 <b>WATER PUMP</b>	Water pump operating lever	Water pump operation. O : OFF I : ON
 <b>WATER FLOW</b>	Water flow knob	Water flow adjusting valve
 <b>MUD MIXER SPEED</b>	Mud mixer rotating speed knob	Mud mixer speed adjusting valve
 <b>HOLD BACK PRESSURE</b> <b>FEED SPEED</b>	Hold back pressure / Fine feed speed valve selection s	Selects between fine feed speed valve and hold back pressure valve to control penetration rate and balance rod weight during drilling.
 <b>ROTATION SPEED</b>	Rotation speed knob	Rotary head rotation speed adjusting valve
 <b>HOLD BACK PRESSURE</b>	Hold back pressure knob	Hold back pressure adjusting valve
 <b>FEED PRESSURE</b>	Feed pressure knob	Feed pressure adjusting valve.
 <b>FEED SPEED</b>	Feed speed knob	Feed speed adjusting valve
 <b>ROTATION HEAD</b>	Rotary head operation lever	Rotary head operation lever (Clockwise or counterclockwise)
 <b>FAST FEED</b>	Rotary head feed operation lever	Rotary head feed movement operation. (Forward or Backward)
 <b>MAIN WINCH</b>	Main winch operation lever	Winding or unwinding main wire
 <b>WIRELINE WINCH</b>	Wireline winch operation lever	Winding or unwinding wireline wire.

● **Safety levers**

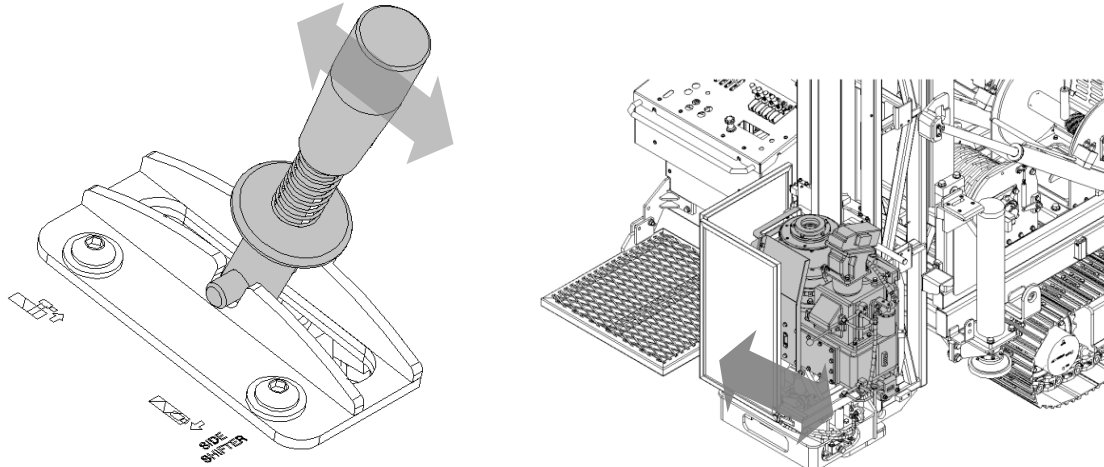
For safety reason, Some levers have self locking system on neutral position. To unlock the lever, pull up the bottom plate with fingers until locking bar is released, then move lever for operation.



*Figure: Unlocking safety lever and operation*



● **Rotary head side shift**

To add or remove pipe efficiently, move the rotary head from drilling position.



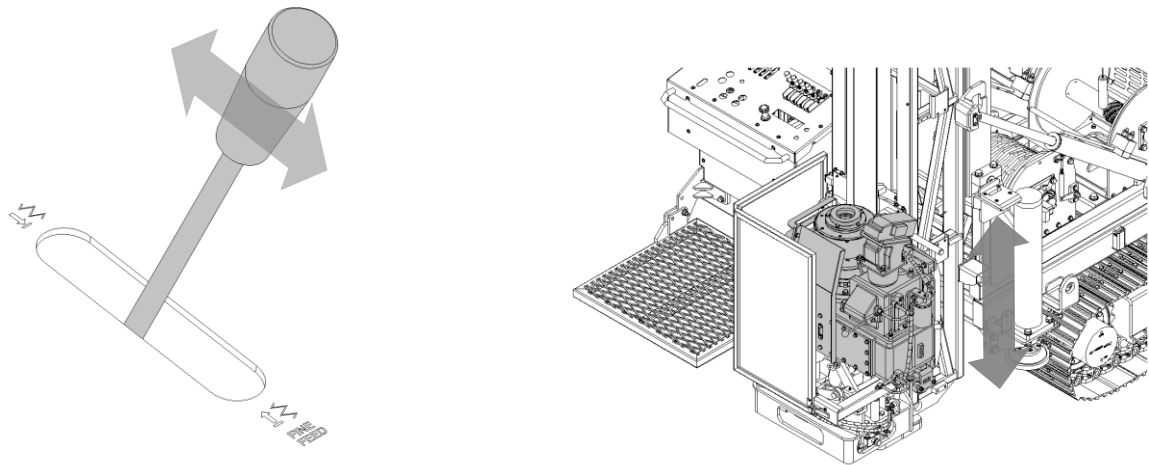
*Figure: Side shift operation*

*Table: Side shift operation*

Symbol	Description	Instruction
	Move rotary head to side position	When lever is pushed, rotary head moves to the side position.
	Move rotary head to drilling position	When lever is pulled, rotary head moves to the drilling position.

● **Fine feed**

To precise and slow feed movement, operate fine feed during drilling.



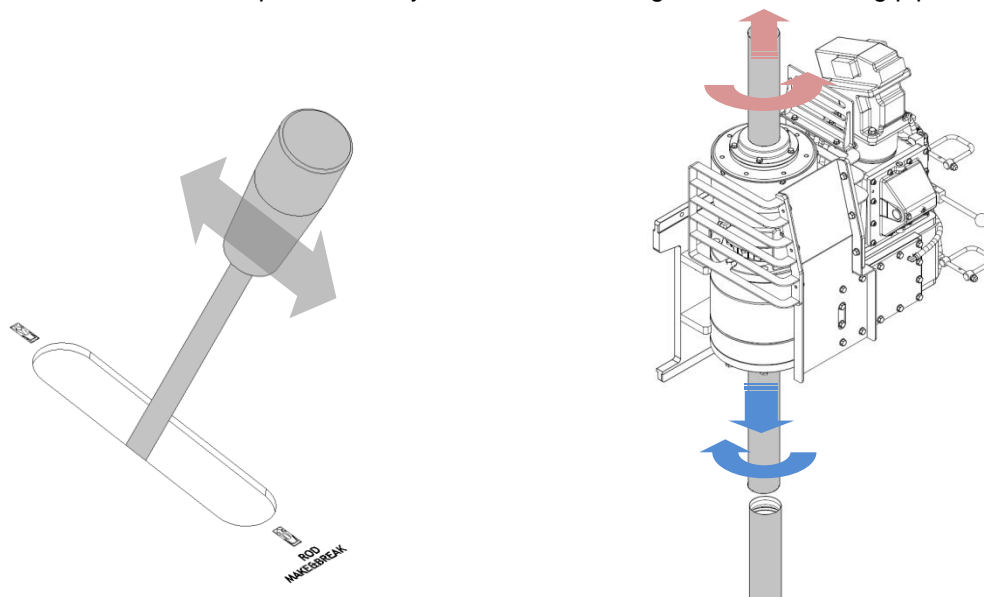
*Figure: Side shift operation*

*Table: Side shift operation*

Symbol	Description	Instruction
	Fine feed (Forward)	Slow feed to drilling forward
	Fine feed (Backward)	Slow feed to backward.



● **Rod make and break**

It control rotation feed speed of rotary head for connecting and disconnecting pipes



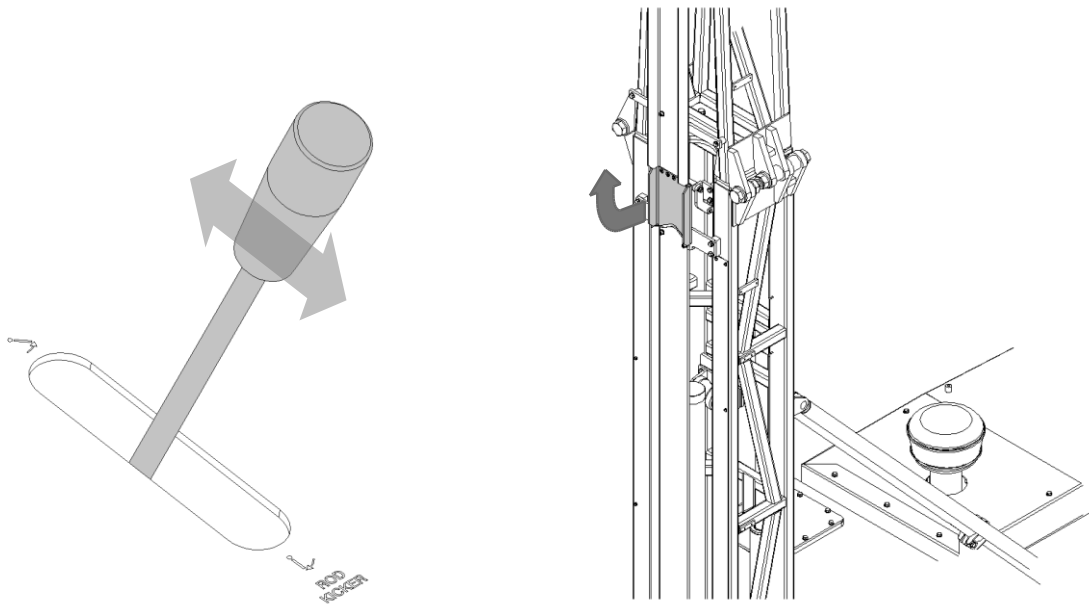
*Figure: Rod make and break operation*

*Table: Rod make and break operation*

Symbol	Description	Instruction
	Rod connect	Feed forward and normal rotation.
	Rod disconnect	Feed backward and reverse rotation.

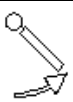

● **Rod kicker**

Rod kicker support pipe on the top side of mast.

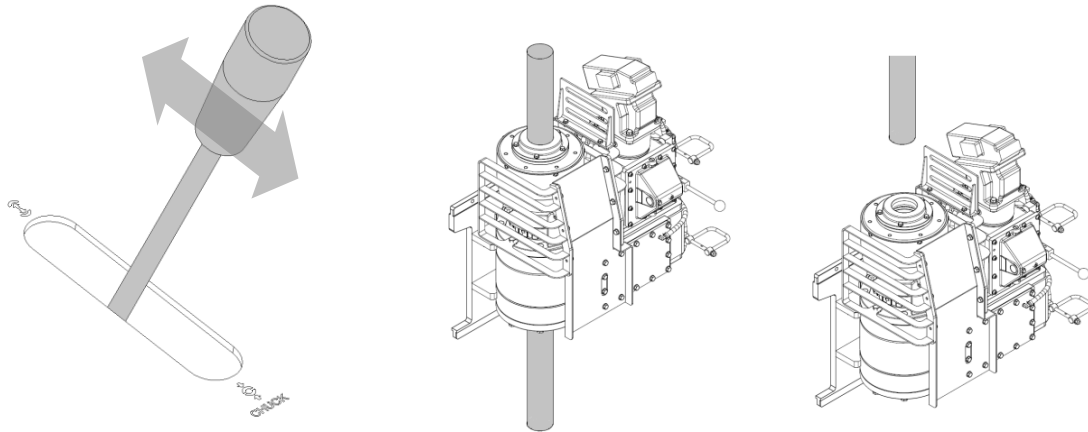


*Figure: Rod kicker operation*

*Table: Rod kicker operation*

Symbol	Description	Instruction
	Rod kicker open	Open rod kicker plate to support pipe
	Rod kicker fold	Fold rod kicker inside of mast.

● **Chuck hold and release**

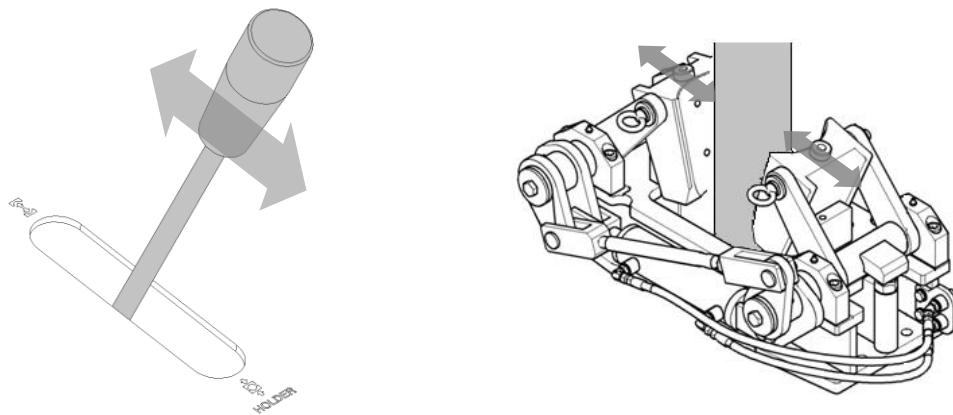


*Figure: Pipe hold and release by chuck*

*Table: Pipe hold and release by chuck*

Symbol	Description	Instruction
	Chuck open	Release pipe by opening chuck
	Chuck close	Hold pipe by closing chuck

● **Foot clamp open and close**

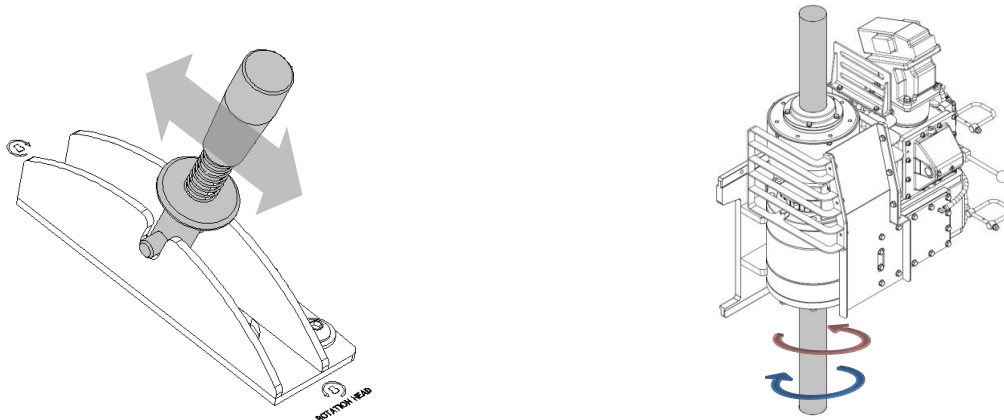


*Figure: Pipe hold and release by foot clamp*

*Table: Pipe hold and release by foot clamp*

Symbol	Description	Instruction
	Foot clamp open	Release pipe by opening foot clamp
	Foot clamp close	Hold pipe by closing foot clamp

● Rotary head rotation control

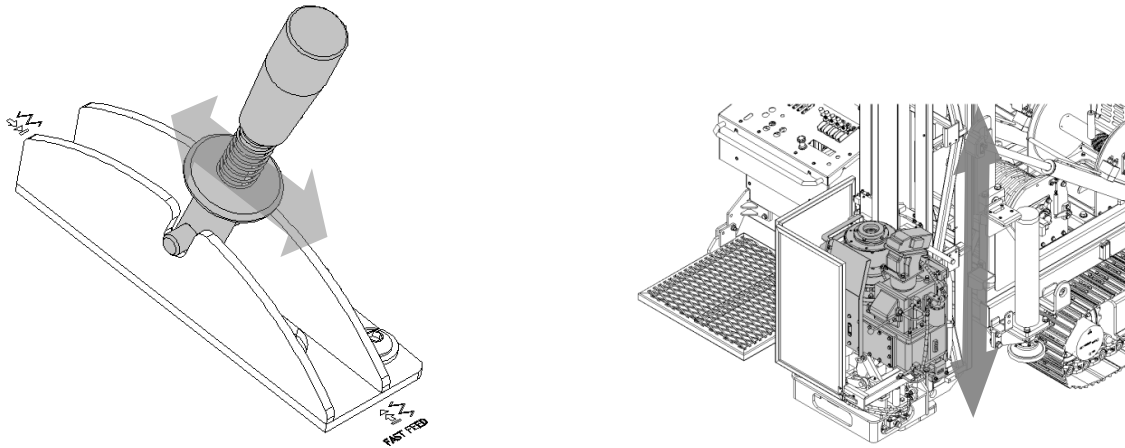


*Figure: Rotary head rotation*

*Table: Rotary head rotation*

Symbol	Description	Instruction
	Normal rotation	Rotary head clockwise rotation
	Reverse rotation	Rotary head counterclockwise rotation.

● Fast feed control



*Figure: Fast feed control*

*Table: Fast feed control*

Symbol	Description	Instruction
	Fast feed forward	Feed forward movement (with high speed)
	Fast feed backward	Feed backward movement (with high speed)



● Main wire winch control

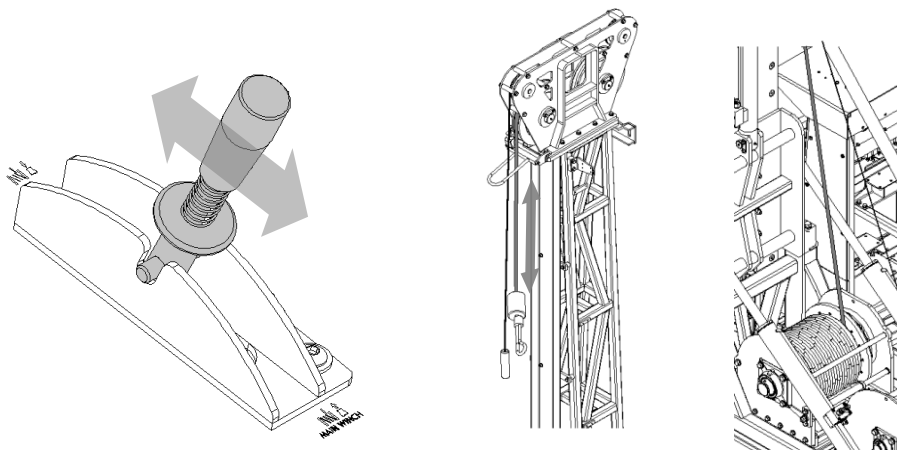




Figure: Main wire winch operation

Table: Main wire winch operation

Symbol	Description	Instruction
	Main winch down	Drop main winch to down.
	Main winch up	Lift main winch to up.

● Wireline winch control

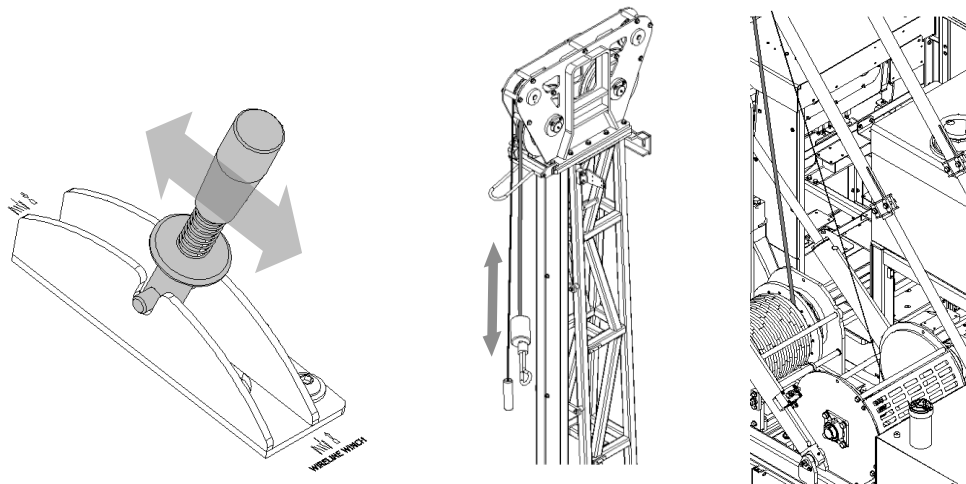


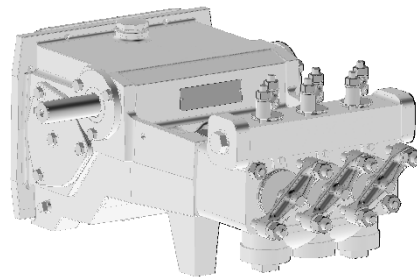
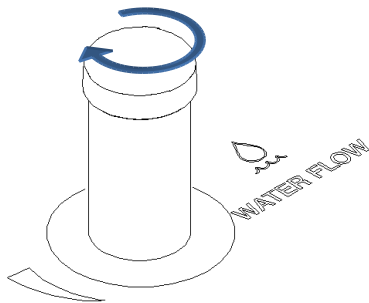


Figure: Wireline winch operation

Table: Wireline winch operation


Symbol	Description	Instruction
	Wireline winch down	Drop Wireline winch to down.
	Wireline winch up	Lift Wireline winch to up.

● Water pump flow control knob

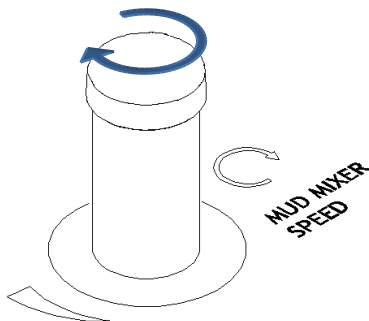


*Figure: Water pump flow control knob*

*Table: Water pump flow control knob*


Symbol	Description	Instruction
 WATER FLOW	Water flow amount control from water pump	Rotate knob to clockwise : Increase water flow.  Rotate knob to counterclockwise : Decrease water flow.

● Mud mixer speed control knob

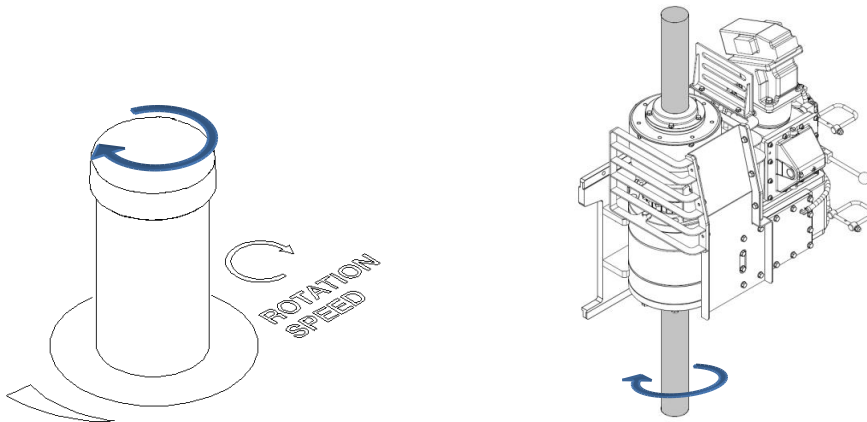


*Figure: Water pump flow control knob*

*Table: Water pump flow control knob*


Symbol	Description	Instruction
 MUD MIXER SPEED	Mud mixer motor speed control	Rotate knob to clockwise : Increase motor speed.  Rotate knob to counterclockwise : Decrease motor speed.

● Rotary head rotation speed control knob

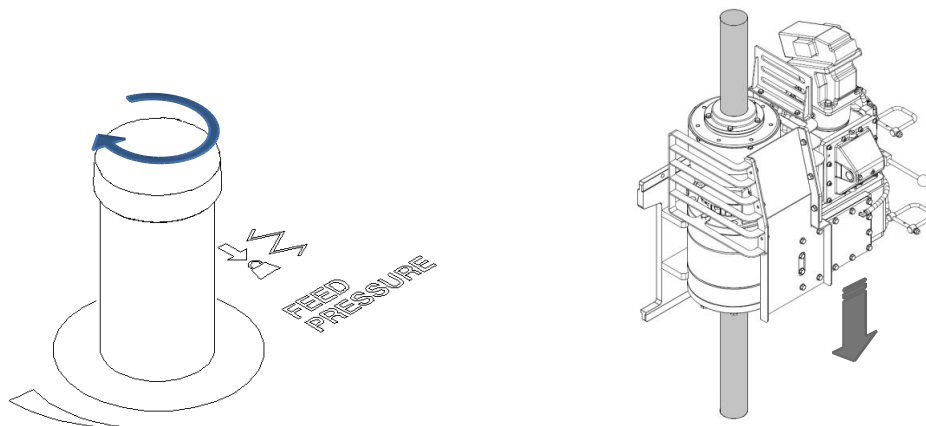


*Figure: Rotary head rotation speed control knob*

*Table: Rotary head rotation speed control knob*


Symbol	Description	Instruction
	Rotary head rotation speed control	Rotate knob to clockwise : Increase rotation speed.  Rotate knob to counterclockwise : Decrease rotation speed.

● Feed pressure control knob

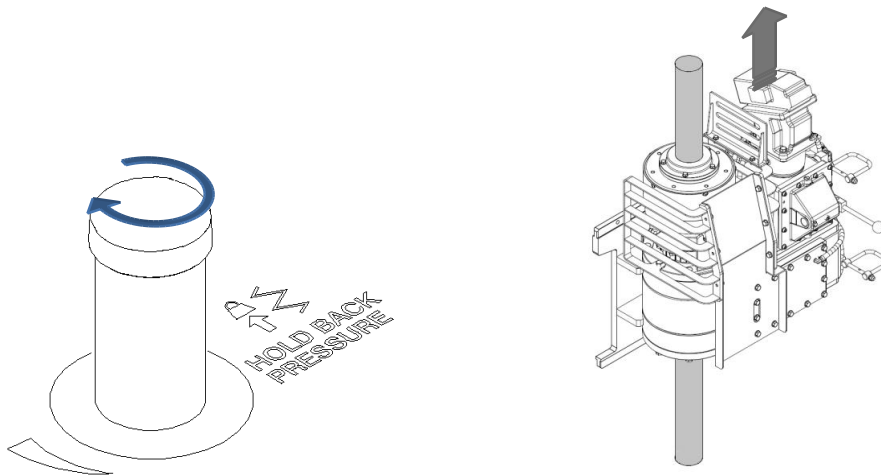


*Figure: Rotary head feed pressure control knob*

*Table: Rotary head feed pressure control knob*


Symbol	Description	Instruction
	Rotary head feed pressure control	Rotate knob to clockwise : Increase feed pressure.  Rotate knob to counterclockwise : Decrease feed pressure.

● **Hold back pressure control knob**

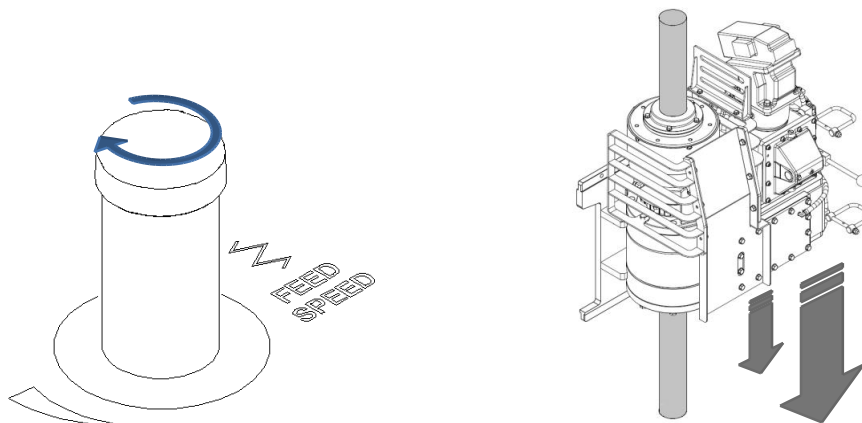


*Figure: Rotary head hold back pressure control knob*

*Table: Rotary head hold back pressure control knob*


Symbol	Description	Instruction
	Rotary head hold back pressure control	Rotate knob to clockwise : Increase hold back pressure.  Rotate knob to counterclockwise : Decrease hold back pressure.

● **Feed speed control knob**



*Figure: Rotary head feed speed control knob*

*Table: Rotary head feed speed control knob*

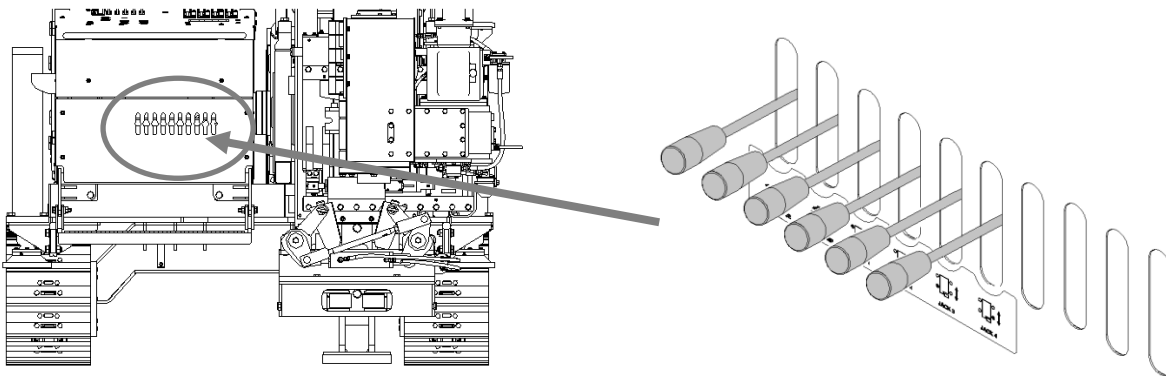
Symbol	Description	Instruction
	Rotary head feed speed control	Rotate knob to clockwise : Decrease feed speed.  Rotate knob to counterclockwise : Increase feed speed.

### 4.5.3 Mast positioning and outrigger operation levers



#### WARNING!

Check all obstacles before operating mast and outrigger. Clear the area where mast and outrigger will be located.

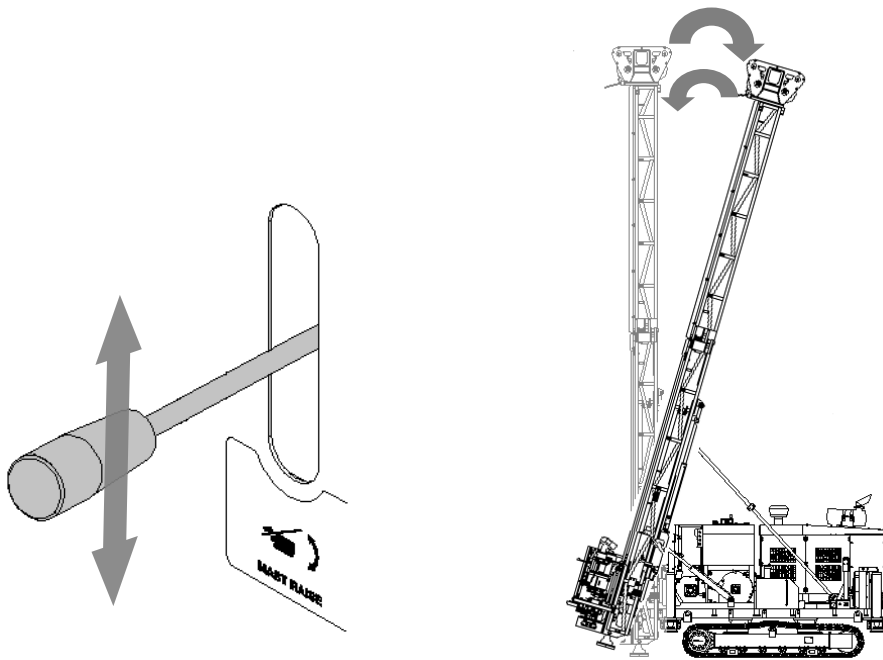


*Figure: Mast and outrigger operating levers*

*Table: Mast and outrigger operating levers*


Symbol	Description	Instruction
 <b>MAST RAISE</b>	Mast raise lever	Mast lift up or down movement
 <b>MAST DUMP</b>	Mast dump lever	Mast forward or backward movement
 <b>JACK 1</b>	Outrigger operation lever 1	Outrigger raise up or down operation
 <b>JACK 2</b>	Outrigger operation lever 2	Outrigger raise up or down operation
 <b>JACK 3</b>	Outrigger operation lever 3	Outrigger raise up or down operation
 <b>JACK 4</b>	Outrigger operation lever 4	Outrigger raise up or down operation

● Mast raise operation

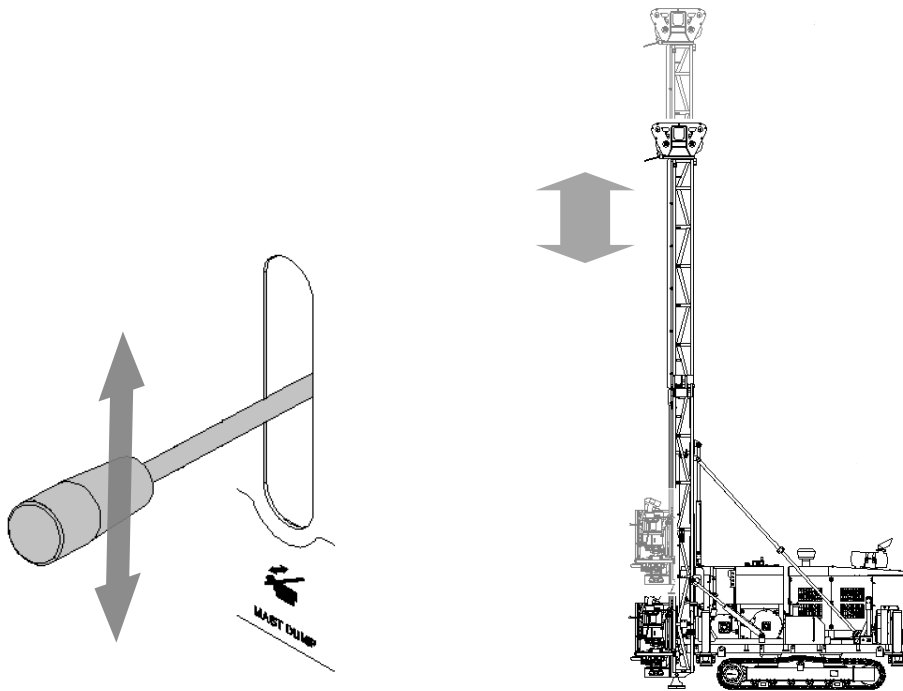


*Figure: Mast raise operation*

*Table: Mast raise operation*


Symbol	Description	Instruction
 <p>MAST RAISE</p>	Mast raise up or lay down movement	Lever up : Mast raise up.  Lever down : Mast lay down

● Mast dump operation

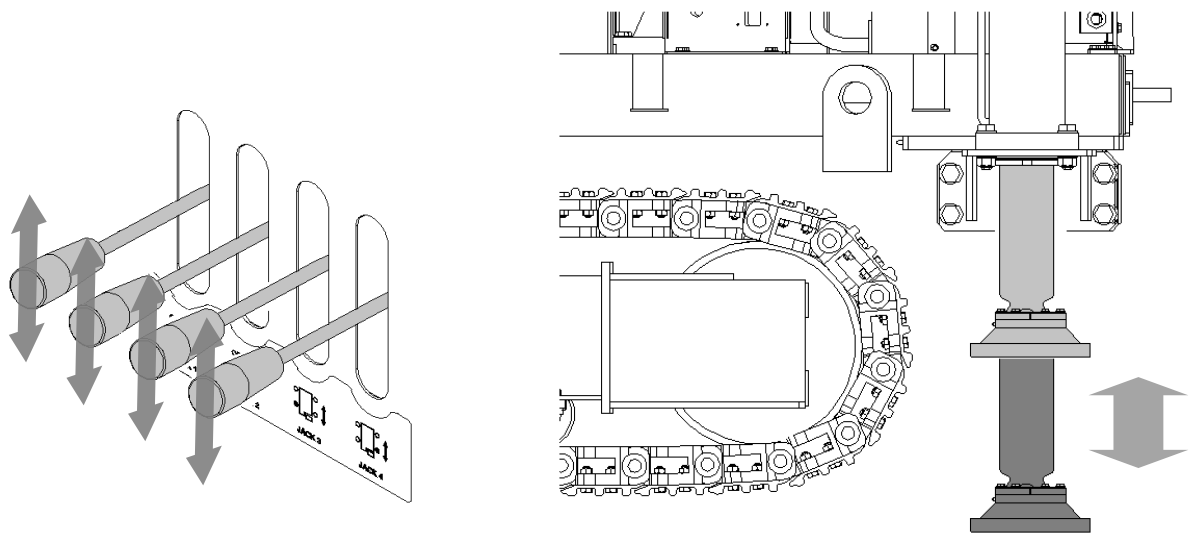


*Figure: Mast dump operation*

*Table: Mast raise operation*

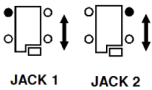
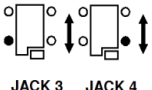
Symbol	Description	Instruction
	Mast forward or backward movement	Lever up : Mast moves backward.  Lever down : Mast moves forward.

● **Outrigger operation**



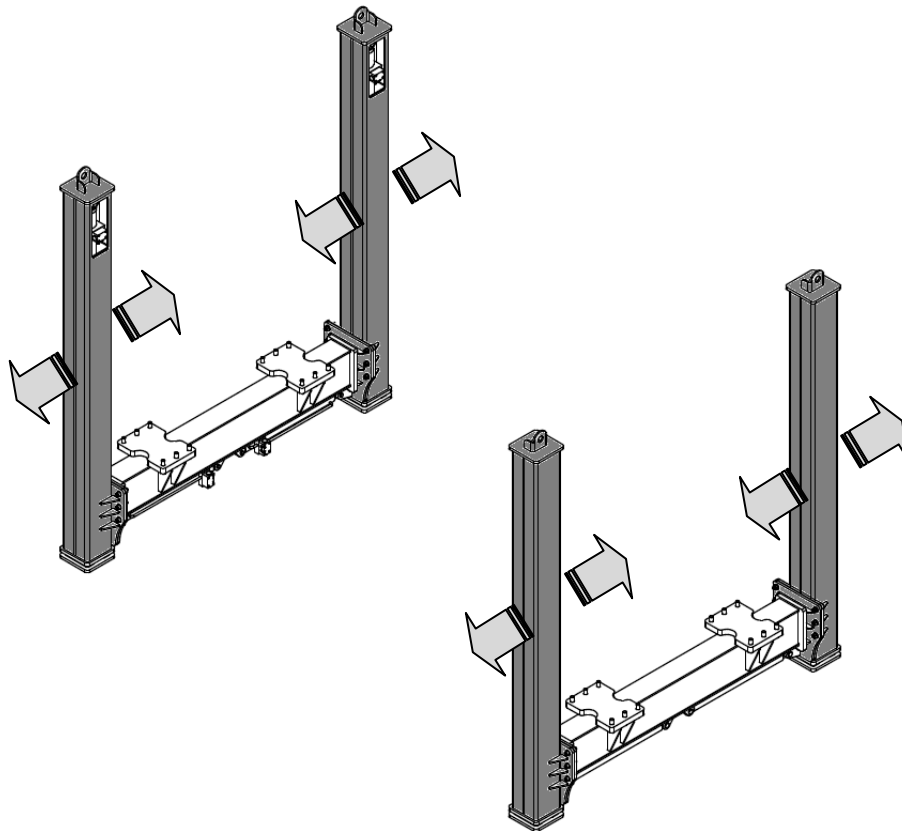
*Figure: Outrigger operation*

*Table: Outrigger operation*

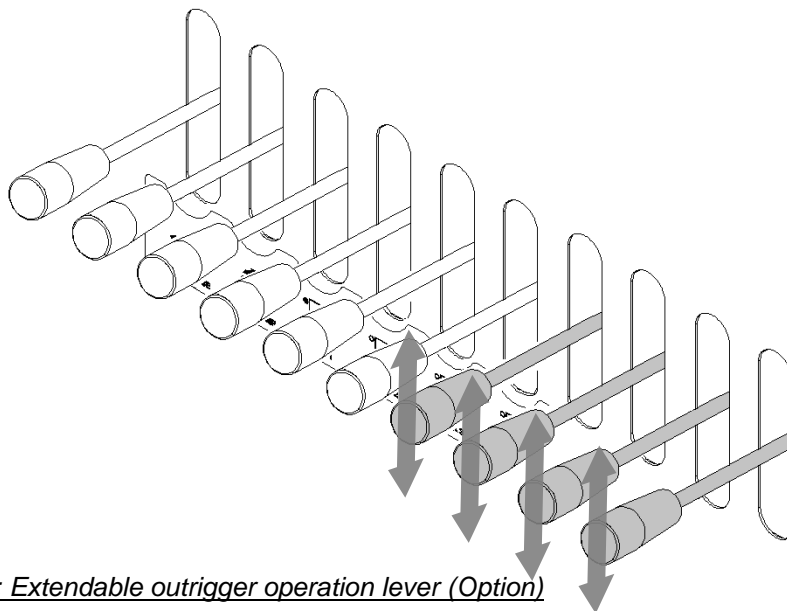
Symbol	Description	Instruction
 <p>JACK 1    JACK 2</p>	Outrigger operation	Lever up : Outrigger fold.
 <p>JACK 3    JACK 4</p>		Lever down : Outrigger extend.



● **Extendable outrigger operation levers (Option)**



*Figure: Extendable outrigger operation*

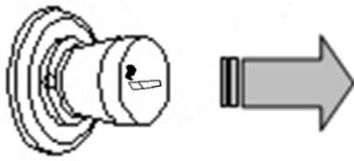


*Figure: Extendable outrigger operation lever (Option)*

Extending or folding outriggers by operating levers. Outriggers operation is done separately by each levers.


● **Cigar jack**

Heat up cigar jack, or power connection for electric devices.



*Figure: Cigar jack*

*Table: Cigar jack*

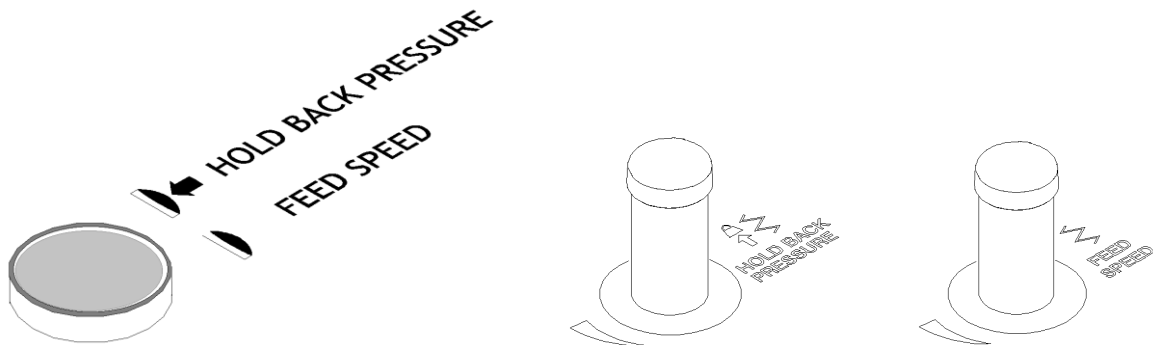
Symbol	Parts	Instruction
	Cigar jack	Push : Heat up Pull out : Removal and disconnect

Note:

Before connecting electric device on cigar jack, check the rated capacity of the device and connector.

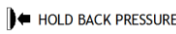

● **Hold back pressure / Feed speed control selection switch**

During drilling, the Feed speed control / Hold back pressure can be switched .



*Figure: Hold back pressure / Feed speed control selection switch*

*Table: Hold back pressure / Feed speed control selection switch*

Symbol	Parts	Instruction
 HOLD BACK PRESSURE  FEED SPEED	Hold back pressure / Feed speed control selection switch	Pushed : Hold back pressure activated Pulled out : Feed speed activated.

Note:

For more detail of use, refer to Chap. "[4.6.7 Hold back pressure operation](#)" section..

## 4.6. Drilling



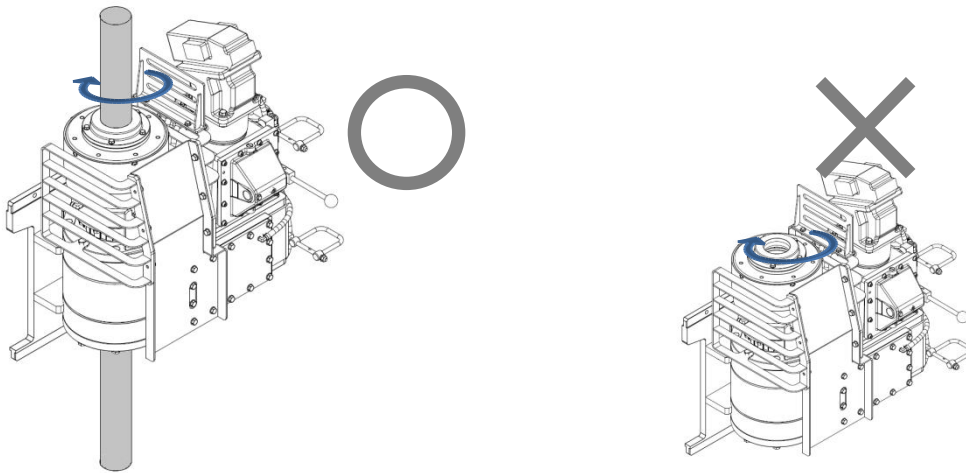
### **DANGER!**

Never approach rotary head, engine, wire line drums, pipe, bit and drilling area while machine is operating.

Some parts may extremely hot. Do not touch hot components with bare hands until it is cooled.

### 4.6.1 Caution for rotary operation

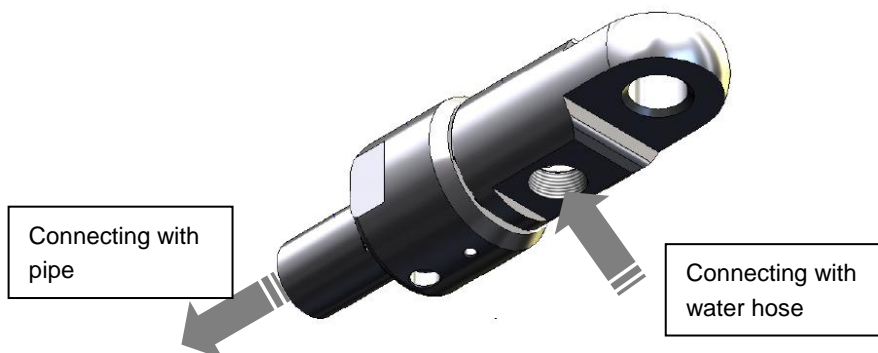
- Do not operate rotary head without holding pipe



Rotary head operation without holding pipe will cause serious damage on the chuck and related parts.

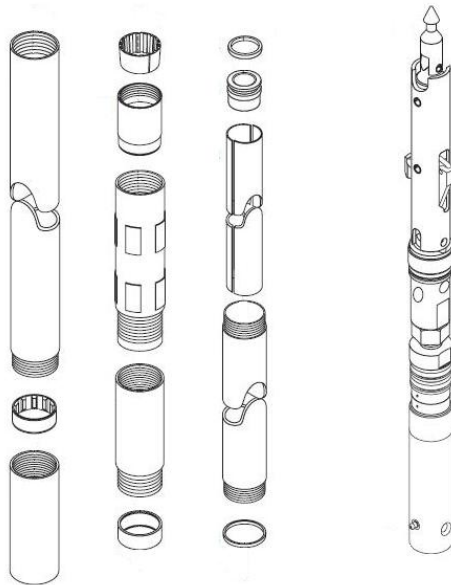
### 4.6.2 Preparation of water swivel

- Connect water swivel with pipe and water hose



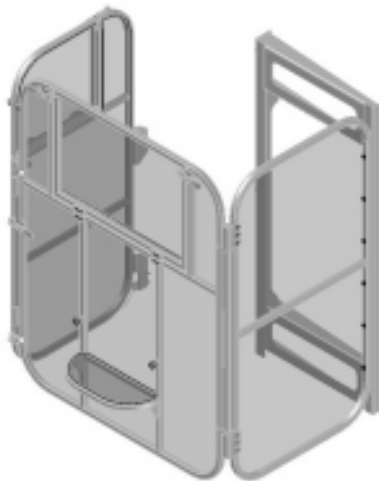
Prepare water swivel to supply water to pipe and bit.

### 4.6.3 Preparation of core barrel



To collect core sample, prepare core barrel and put it on the pipe. Check core barrel, inner pipe and components carefully. Bent or damaged parts should be replaced with new one.

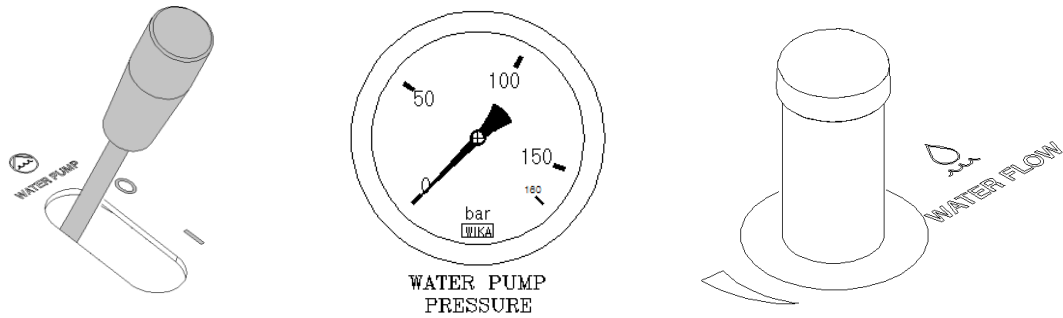
### 4.6.4 Spin cage locking condition check



For safety measure, some operation can not be performed if spin cage gate is opened. Check approximate sensor on the gate, and working condition of rotary head when the gate is closed.

#### 4.6.5 Before drilling

- ① Start water pump by operation lever, and check water pressure and adjust output water amount.



- ② Check water leakage from hose, fittings and swivel.

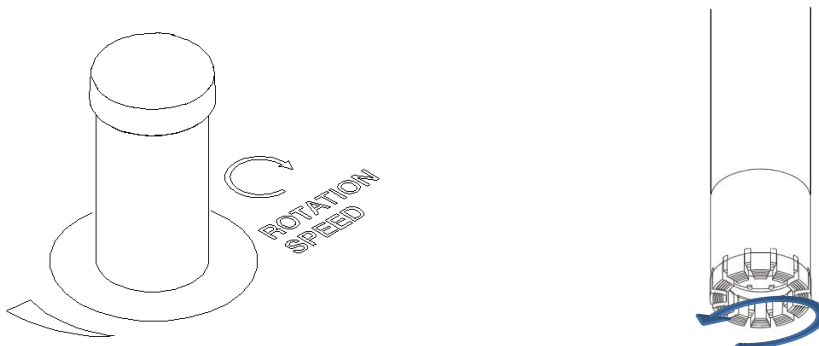
#### 4.6.6 Start rotary head operation.

- ① Determined the rotation speed and torque according to ground condition and pipe size.

Transmission	ECR12		ECR18	
	Speed, RPM	Torque, Nm (lb-ft)	Speed, RPM	Torque, Nm (lb-ft)
1	134 - 189	4,155 - 2,947 (3,064 - 2,173)	128 - 178	5,541 - 3,990 (4,086 - 2,942)
2	303 - 426	1,847 - 1,310 (1,362 - 966)	288 - 400	2,462 - 1,774 (1,815 - 1,308)
3	538 - 758	1,039 - 737 (766 - 564)	511 - 711	1,385 - 998 (1,021 - 736)
4	968 - 1,364	577 - 409 (425 - 313)	920 - 1,200	700 - 554 (567 - 408)

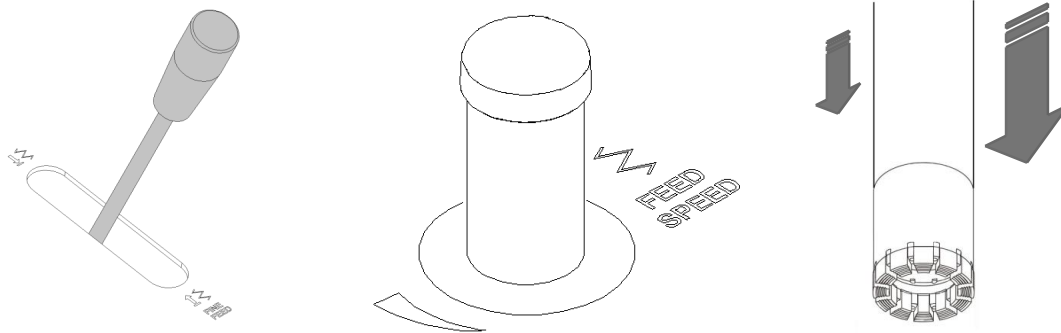
*Chart: Rotary head RPM and Torque according to Transmission setting*

- ② Open foot clamp and operate rotary head.
- ③ Adjust the bit rotation speed with rotation speed control knob.



#### 4.6.7 Starting fine feed

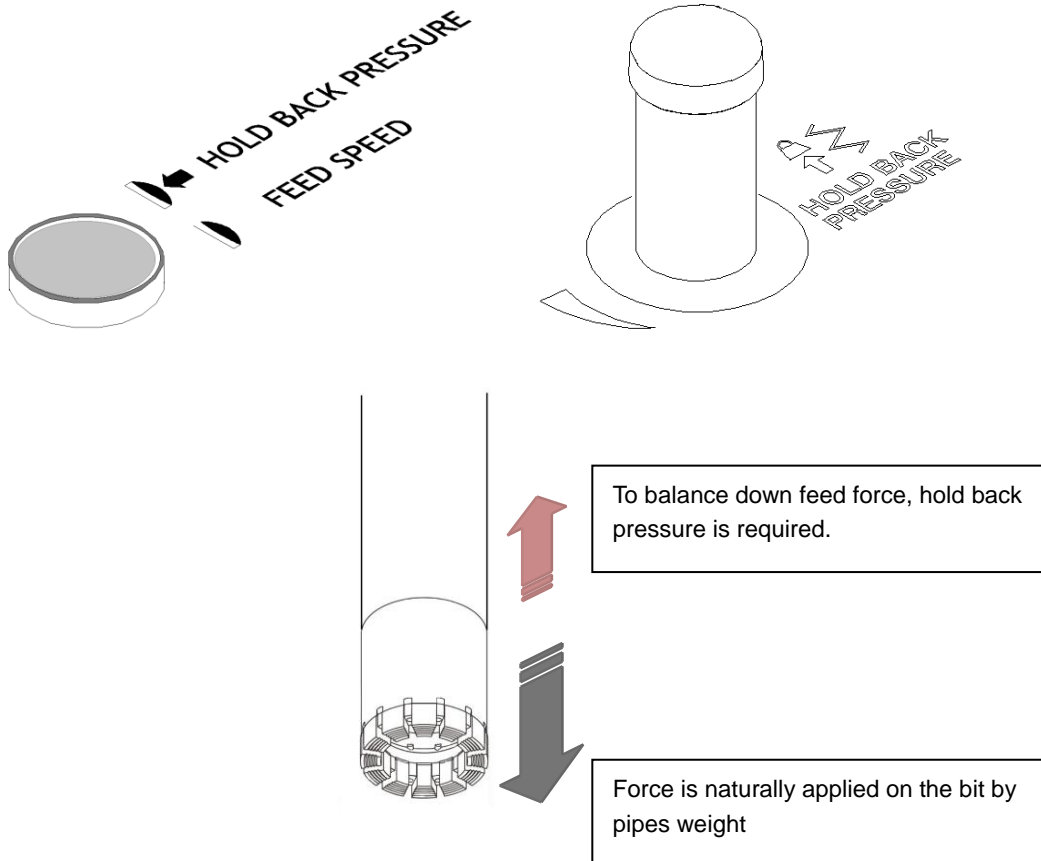
- ① Start fine feed with operation lever, and adjust feed speed with feed speed control knob.



- ② Adjust feed pressure and speed with knobs. Too much feed pressure and speed may cause the bit early wear or damage.

#### 4.6.8 Hold back pressure operation

- ① When drilled hole is deep, the weight of accumulated pipe is naturally makes feed force. Under this condition, the backward force on the feed is required to support drilling on the bit. To balance feed force, operate and control hold back pressure  
Select 'Hold back pressure' mode by pushing switch, and adjust hold back pressure with control knob.



#### 4.6.9 Understanding on the OFF Pressure and Down ward force on Bit

- **WOB (Weight On Bit, downward force on bit)**

The force on the bit is approximately equal to the weight of pipe and feed force. Actual WOB can not be measured, however it can be calculated by OFF Pressure method as described below.

- **Off Pressure measuring**

(1) After adding the pipe, operate normal rotation of rotary head and fine feed forward.

Before the bit contacting on the ground, see the 'Feed force pressure' gauge.

(2) When the bit is contacting on the bottom of drilled hole and start drilling, read the 'Feed force pressure' on the gauge.

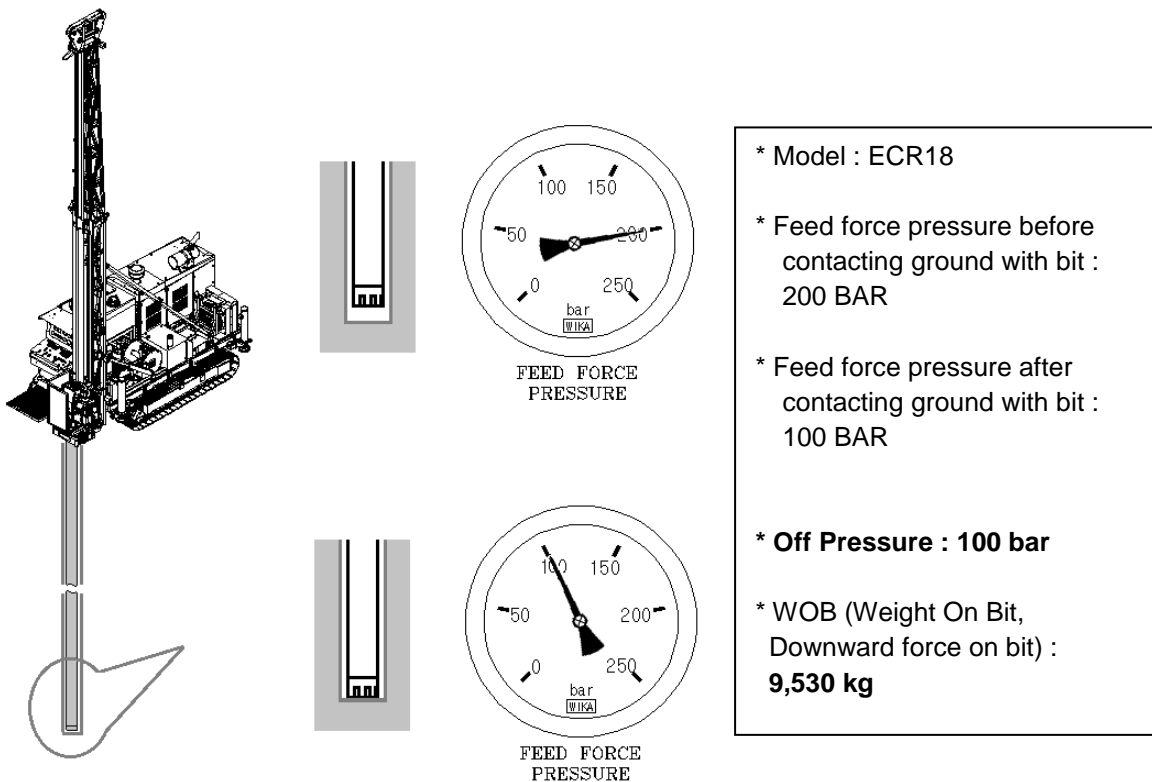
(3) Then, calculate the actual decreased pressure difference as shown below.

\* Measured feed force pressure before contacting bit with ground : A

\* Measured feed force pressure when bit is contacting with ground : B

\* Off pressure = A - B

\* After calculating Off pressure, refer to the following chart to see the actual WOB (downward force on the bit)



Example: Off Pressure calculation

\* WOB (or Downward force on bit) calculation (kg base)

- ECR12 : Off pressure (BAR) x 63.62

- ECR18 : Off pressure (BAR) x 95.03

**ECR12**

Off Pressure		Downward Force on Bit		Off Pressure		Downward Force on Bit	
BAR	PSI	kg	Lbf	BAR	PSI	kg	Lbf
5	73	318	701	105	1,523	6,680	14,726
10	145	636	1,403	110	1,595	6,998	15,428
15	218	954	2,104	115	1,668	7,316	16,129
20	290	1,272	2,805	120	1,740	7,634	16,830
25	363	1,590	3,506	125	1,813	7,952	17,532
30	435	1,909	4,208	130	1,885	8,270	18,233
35	508	2,227	4,909	135	1,958	8,588	18,934
40	580	2,545	5,610	140	2,030	8,906	19,635
45	653	2,863	6,311	145	2,103	9,225	20,337
50	725	3,181	7,013	150	2,175	9,543	21,038
55	798	3,499	7,714	155	2,248	9,861	21,739
60	870	3,817	8,415	160	2,321	10,179	22,440
65	943	4,135	9,116	165	2,393	10,497	23,142
70	1,015	4,453	9,818	170	2,466	10,815	23,843
75	1,088	4,771	10,519	175	2,538	11,133	24,544
80	1,160	5,089	11,220	180	2,611	11,451	25,245
85	1,233	5,407	11,921	185	2,683	11,769	25,947
90	1,305	5,726	12,623	190	2,756	12,087	26,648
95	1,378	6,044	13,324	195	2,828	12,405	27,349
100	1,450	6,362	14,025	200	2,901	12,723	28,050

*Chart: ECR12 Off Pressure and Downward force on bit*

**ECR18**

Off Pressure		Downward Force on Bit		Off Pressure		Downward Force on Bit	
BAR	PSI	kg	Lbf	BAR	PSI	kg	Lbf
5	73	475	1,048	105	1,523	9,978	21,999
10	145	950	2,095	110	1,595	10,454	23,046
15	218	1,425	3,143	115	1,668	10,929	24,094
20	290	1,901	4,190	120	1,740	11,404	25,141
25	363	2,376	5,238	125	1,813	11,879	26,189
30	435	2,851	6,285	130	1,885	12,354	27,237
35	508	3,326	7,333	135	1,958	12,829	28,284
40	580	3,801	8,380	140	2,030	13,305	29,332
45	653	4,276	9,428	145	2,103	13,780	30,379
50	725	4,752	10,476	150	2,175	14,255	31,427
55	798	5,227	11,523	155	2,248	14,730	32,474
60	870	5,702	12,571	160	2,321	15,205	33,522
65	943	6,177	13,618	165	2,393	15,680	34,570
70	1,015	6,652	14,666	170	2,466	16,156	35,617
75	1,088	7,127	15,713	175	2,538	16,631	36,665
80	1,160	7,603	16,761	180	2,611	17,106	37,712
85	1,233	8,078	17,809	185	2,683	17,581	38,760
90	1,305	8,553	18,856	190	2,756	18,056	39,807
95	1,378	9,028	19,904	195	2,828	18,531	40,855
100	1,450	9,503	20,951	200	2,901	19,007	41,902

*Chart: ECR18 Off Pressure and Downward force on bit*



#### 4.6.10 Stop drilling operation

- ① Stop fine feed by put the fine feed operation lever on neutral position.
- ② Stop rotation of rotary head by put the rotary head operation lever on neutral position.
- ③ It is recommended to flush the drill hole for some minutes after stopping drilling to avoid problems from cuttings and sludge.

#### 4.6.11 Wireline operation and collecting sample

- ① Operate wireline lever, and put the wire to catch the core barrel.
- ② After catching the core barrel, and pull out the wire with wireline lever operation.

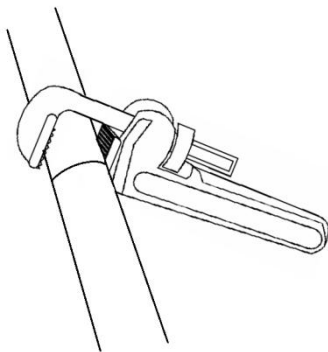


#### **IMPORTANT!**

Do not stop wireline winch suddenly. Otherwise, it may cause a jump and core barrel locking will loose the grip, then it can be fallen inside of hole.

#### 4.6.12 Adding and connecting the pipe

- ① Lift up a pipe with main wire winch, and put it inside of rotary head.
- ② Grab the pipe with rotary head chuck and move it until it reaches on the pipe which grab by foot clamp.
- ③ Use 'rod make' operation to connect pipes
- ④ If requires, use pipe wrench when pipe is adding or removing.



*Figure: Pipe wrench*

#### 4.6.13 Removing and disconnecting the pipe

- ① Connect upper pipe with main winch, and lift up a pipe and hold bottom pipe with foot clamp.
- ② Disconnecting pipes with 'rod break' operation.
- ③ After disconnecting the pipe, remove upper pipe by using main winch operation.

## 5. Maintenance

---



### **DANGER!**

Do not operate machine during maintenance.

Some parts may be very hot. Do not touch parts until they are cooled down.

Wear safety glove, helmet, glass and mask for personal safety.



### **WARNING!**

Put safety sticker or warning tag and alert to others if maintenance of machine is not finished.

Observe maintenance schedule as describes in this manual. If you have doubt on maintenance method, contact to Everdigm official distributor.

The failure resulted from the lack of maintenance will not be covered by warranty.

During the maintenance of electric devices, turn off master key and remove batteries in advance.

Some parts are might be pressurized by hydraulic or air. Depressure the components before maintenance. Please note that some parts may fall when pressure is falling.



### **IMPORTANT!**

It is recommended putting the maintenance record.

Clean equipment and remove rock powder and dust before maintenance. Dust will cause wear of moving parts, troubles on hydraulic components and blockage of air intake and cooling system.

For environment protection, prepare empty bottle and oil cleaning papers. Drained liquid, oil and grease from the machine should be disposed according to environmental regulation.

Register the engine warranty to official engine service which is located nearest by machine. Engine warranty registration should be done before 200 engine hour on tachometer.

Use only genuine Everdigm parts.

Use recommended oils and grease. Do not mix oil.

Use high grade diesel which is recommended by engine manufacturers.

## 5.1. Maintenance schedule

### 5.1.1 Engine and related parts

○: Check    ⊙: Clean    ◆: Lubricate    ◆: Replace

Compartment or System	Maintenance interval (Every)							
	Daily	50H	200H	250H	500H	1000H	1500H	2000H
Engine oil		1) ◆		◆				
Engine oil filters		1) ◆		◆				
Fuel level	○							
Fuel leakage	○							
Fuel-water separator filter		1) ◆		◆				
Fuel filters		1) ◆		◆				
Drain of water from fuel tank and separator.	○	⊙						
Breather filter							◆	
Leakage and contamination of Coolant	○	⊙						◆
Fins on radiator	⊙							
Engine belt	○							
Intercooler and hose				○				
Air cleaner indicator				○				
Air suction line and connector		○						
Main battery	○							
Wiring and connector		○						
Primary air filter	○	2) ⊙						
Secondary air filter	○	2) ⊙					◆	
Centerflex		○					◆	

\*1) First replacement period

\* 2) Daily check, clean if it blocked. Damaged filters should be replaced immediately.

### 5.1.2 Track

○: Check ◎: Clean ◆: Lubricate ◇: Replace

Compartment or System	Maintenance interval (Every)							
	Daily	50H	200H	250H	500H	1000H	2000H	4000H
Tension of track shoe		○						
Oil leakage	○							
Motor gear oil					1)◆	◆		
Wear of roller and idler		○						
Bolts loosening	○							

\*1) First replacement period

### 5.1.3 Hydraulic oil

○: Check ◎: Clean ◆: Lubricate ◇: Replace

Compartment or System	Maintenance interval (Every)							
	Daily	50H	200H	250H	600H	1200H	1800H	2400H
Hydraulic oil	○	1)◆				◆		
Cooler fan	◎							
Hydraulic oil tank						◎		
Return filter		1)◆				3)◆		
Air breather		○				◆		
Suction hose and connector	○					◎		
Suction filter						◆		
Drain of water from hydraulic oil tank		○						
High Pressure Filter							◆	

\*1) First replacement period

\*3) It needs to be change one time as indicated above table. It can be changed according to installed filter condition. Check it when oil is replaced.

### 5.1.4 Rotary head

○: Check ◎: Clean ◆: Lubricate ◇: Replace

Compartment or System	Maintenance interval (Every)							
	Daily	50H	200H	250H	500H	1000H	1500H	2000H
Gear box	○							
Strainer filter				◎				
Gear oil				◆				
Oil filter				◆				
Jaw on the chuck	◆	◎						
Chuck ball bearing	◆							
Rotary head cradle	○	◆						
Side Shift		◆					◇	

### 5.1.5 Mast and foot clamp

○: Check ◎: Clean ◆: Lubricate ◇: Replace

Compartment or System	Maintenance interval (Every)							
	Daily	50H	200H	250H	500H	1000H	2000H	4000H
Oil leakage	○							
Bolts, nuts and fittings		○						
Crack, bent, damages	○							
Grease supply on moving parts (Pin and bushes)	◆							
Upper crown pulley	◆							
Foot clamp jaw		◎						
Foot clamp cylinder	○				◆			
Hose and connector	○							

### 5.1.6 Wire winch

○: Check ◎: Clean ◆: Lubricate ◇: Replace

Compartment or System	Maintenance interval (Every)							
	Daily	50H	200H	250H	500H	1000H	2000H	4000H
Main winch	◆							
Wire line winch	◆							
Main wire	○	◆						
Wireline wire	○	◆						
Main winch motor oil					1) ◆	◆		

\*1) First replacement period

## 5.2. Oils, lubricants and coolant

### 5.2.1 Specification of oils and lubricants

Compartment or System	Category and Classification	Quantity	Ambient Temperature (°C)							
			-30	-20	-10	0	10	20	30	40
Fuel Tank	Diesel	250 liter	No.2-D							
			No.1-D or No.2-D							
Engine oil	Engine oil API CH-4 or CI-4	18.9 liter	SAE 0W30 (-38~0°C)							
			SAE 5W30(-28~22°C)							
			SAE 10W30(-22~22°C)							
			SAE 0W40, SAE 5W40, SAE 15W40(-15~55°C)							
Hydraulic Tank	Hydraulic oil	320 liter	ISO VG32							
			ISO VG46							
			ISO VG 68							
Rotary head	Gear oil, API GL-4 or GL-5	15 Liter	SAE 90							
Main winch motor		1.8 Liter								
Travel motor		1.3 Liter								
Grease nipples	Grease EP	-	NLGI No. 2							
Main winch wire	Brilube		Brilube 20 or Brilube 35							
Wire line wire										

Table: Specification of oils and lubricants

## 5.2.2 Coolant



### **DANGER!**

Coolant contains toxic chemical. If you drink coolant by accident, throw up immediately, and consult doctor right away.

If coolant get into eyes, clean it with purified water and consult doctor immediately.

Coolant may hot after running machine. Before maintenance of coolant, cool down system first of all.



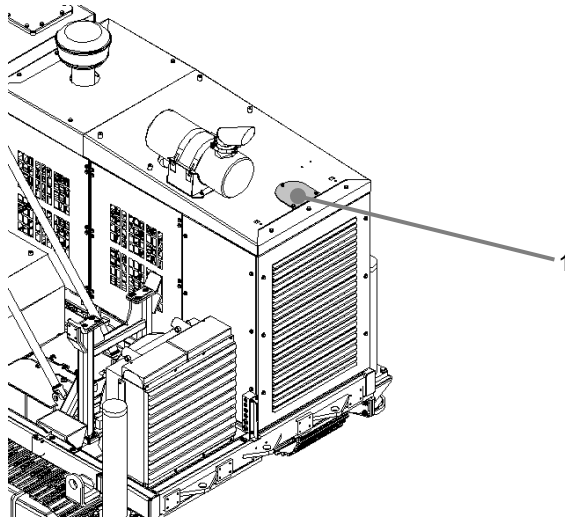
### **IMPORTANT!**

Do not mix different coolant in radiator.

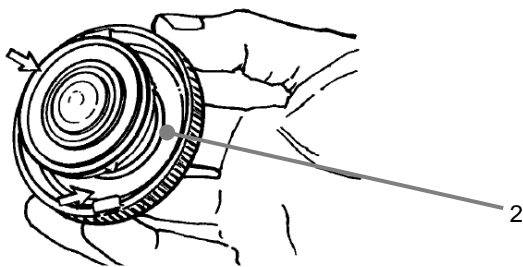
Use coolant water only. Mineral or normal water will cause corrosion and blockage of cooling system.

Check amount of coolant on radiator, and refill coolant. Open cover plate (marked "1") and open radiator cap (marked "2"). Check sealing condition and spring on the cap.

For refill coolant, mix coolant water 50% and antifreeze 50% ratio. Hot or cold climate countries, check the description of antifreeze and mix coolant according to antifreeze manufacturer recommendation.



*Figure: Coolant inlet location*



*Figure: Radiator cap*



*Figure: Reservoir tank*

### 5.3. Storage



#### **IMPORTANT!**

Improper storage condition may cause corrosion of components and machine.

When machine is likely to be stored more than 2 weeks, it is highly recommend following the guideline below.

#### ● **Preparation for machine storage**

- Inspect machine and components of worn out and damaged parts thoroughly.  
Replace new parts before storage.
- Remove all dusts and dried grease on the components.
- After washing machine, dry all components completely.
- Repaint area where paint peeled out. Put new safety sticker if it is lost or hard to read.
- Put the machine in door where has well ventilation and dry condition, and set the mast with [parking posture](#).
- Put grease on every lubrication points
- Spray anti rust fluid all around the machine and components.
- Check winding condition of wire inside of winch. Rewind wires and put oil or grease to prevent rust.
- Turn off master switch, and disconnect battery from machine.
- If machine will be stored outdoor storage area, machine should be covered with roof with good ventilation.
- It is not recommended if machine is stored nearby sea shore.

Before operating machine after long term storage, it is highly recommend following the guideline below.

#### ● **Machine operation after long term storage**

- Drain water from fuel tank and compressor receiver tank
- Remove dried grease and anti rust fluid from the machine and components
- Check oil and fuel levels, and refill it if required.
- Check voltage on battery, then recharge or replace it if required. Then connect batteries with machine.
- Start engine and run it at least 5 minutes
- During engine idling check components if oil is leaking.
- Carefully check all systems and functions before operating in the job site.



## 5.4. Maintenance guideline

### 5.4.1 Engine oil, oil filter and fuel filter replacement.

- Engine oil, oil filter

: Maintenance interval (50 hour after first operation, Every 250 engine hour)

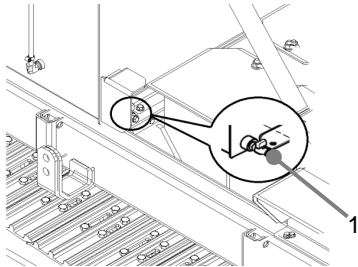


Figure: Drain port

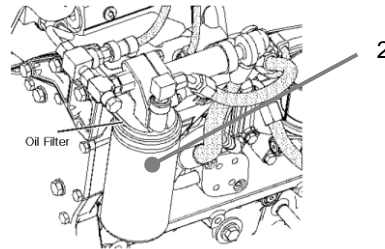


Figure : Oil filter



Figure: Filter change

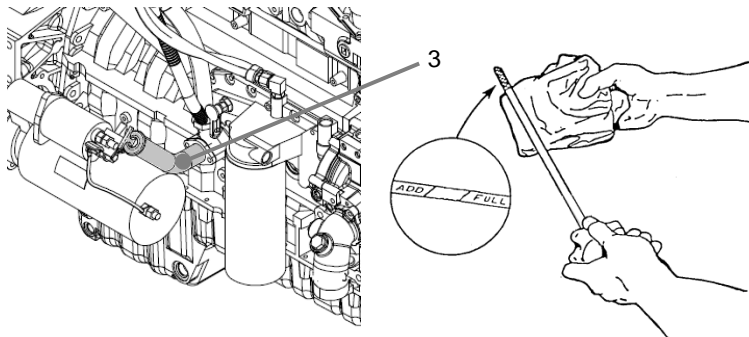
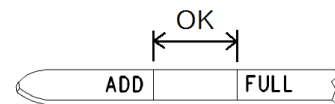


Figure : Dip Stick



Note:

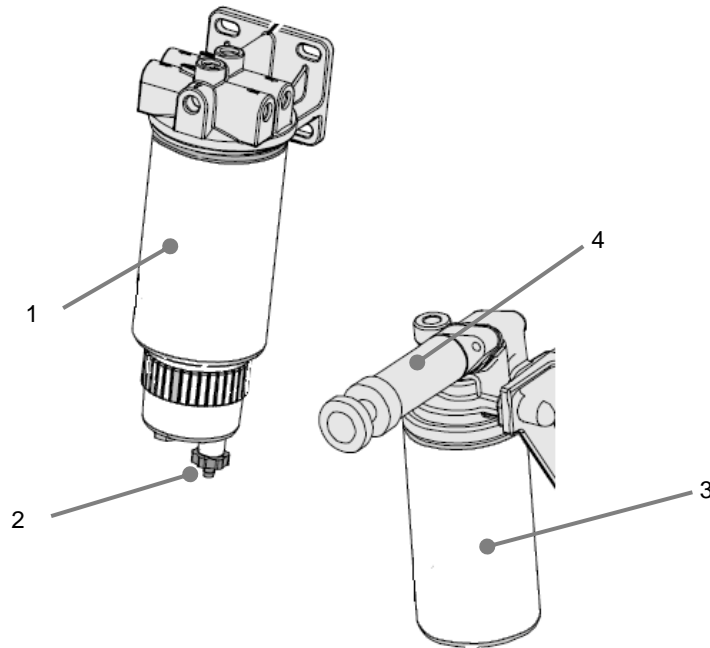
The above figures may be different according to engine models.

Table: Engine oil and filter maintenance

Check point	Parts	Instruction
1	Engine oil drain cock	Prepare empty bottle, and drain engine oil by opening drain cock.
2	Oil filter	Remove old filter and replace with new one. During filter change, check the seal or gasket on the filter
3	Dip stick	Putting engine oil and pull out dip stick. Clean it with rug, and put the dip stick and pull out then check oil amount. Refill the engine oil. Run engine for 3 minutes with idle rpm, then stop the engine and wait 10 ~ 20 minutes. Check oil amount by dipstick, and refill engine oil repeatedly.

● Fuel filter and water separator

: Maintenance interval (50 hour after first operation, Every 250 engine hour)



*Figure : Fuel water separator and fuel filter*

**Note:**

The above figures may be different according to engine models.

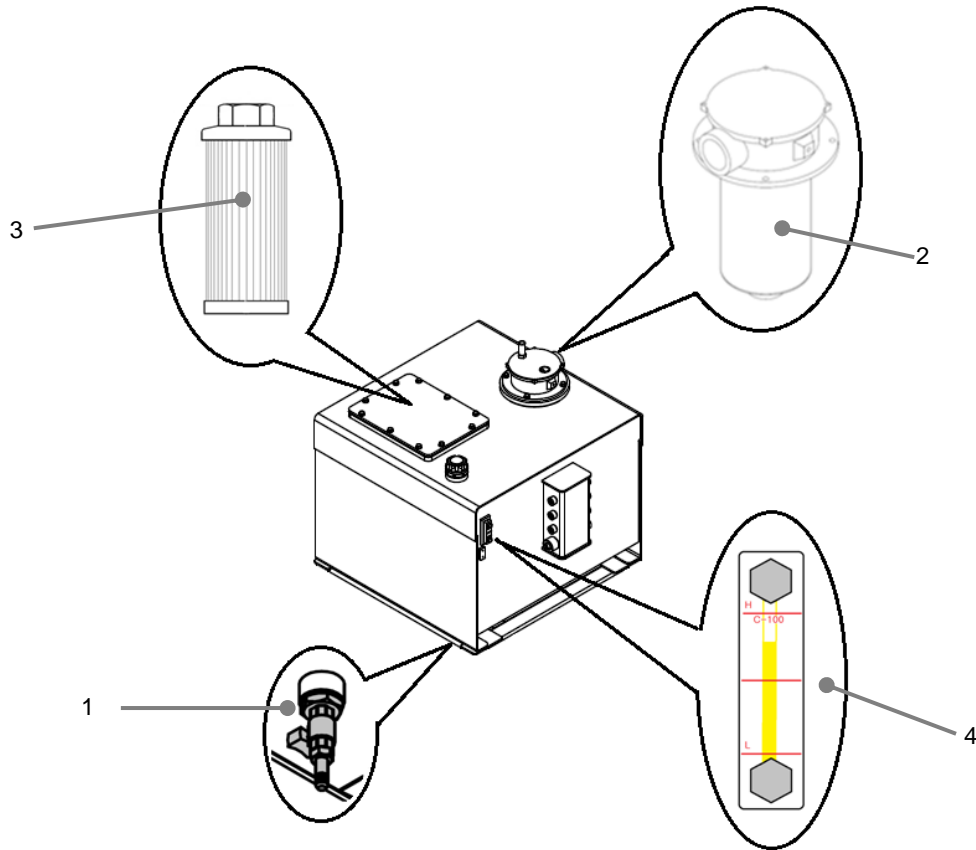
*Table: Fuel-water separator and fuel filter*

Check point	Parts	Instruction
1	Fuel-water separator	Remove old filter and replace new filter according to maintenance schedule.
2	Water drain cock	Before starting engine, drain water by drain cock (Everyday).
3	Fuel filter	Remove old filter and replace new filter according to maintenance schedule.
4	Fuel lift pump	After replacing fuel filter, push lifting pump several times to lift up the fuel to engine.

### 5.4.2 Hydraulic oil and return filter replacement.

- Hydraulic oil and filter

: Maintenance interval (50 hour after first operation, Every 500 engine hour)



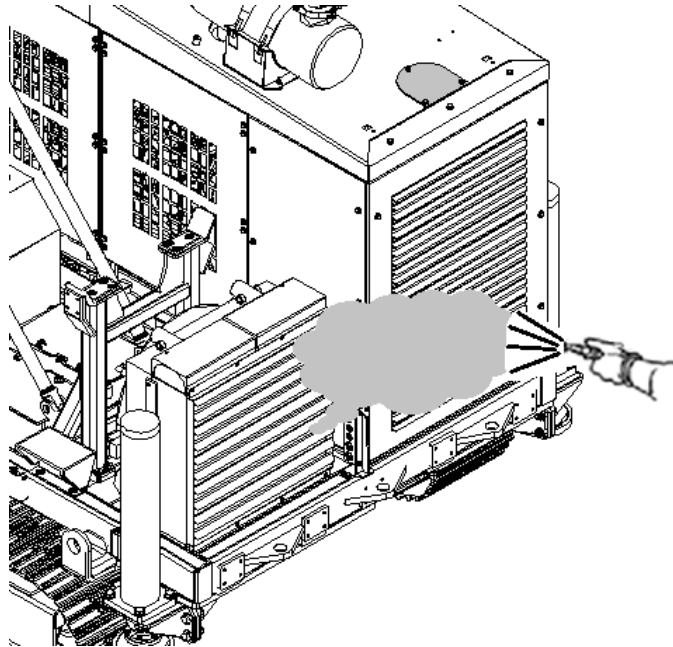
*Figure : Hydraulic oil drain*

*Table: Hydraulic oil and return filter replacement*

Check point	Parts	Instruction
1	Hydraulic oil drain	Prepare empty bottle, and drain hydraulic oil by opening drain cock.
2	Return filter	Dismantle hose connection and remove old filter and replace with new one
3	Suction filters	Dismantle cover plate and remove old suction filters and replace with new ones.
4	Level gauge	After putting hydraulic oil, operate equipment slightly, then turn off engine and check oil level. If required, refill hydraulic oil on the tank

### 5.4.3 Cooler and radiator cleaning.

- Radiator and cooler cleaning  
: Maintenance interval (Daily, after operation)



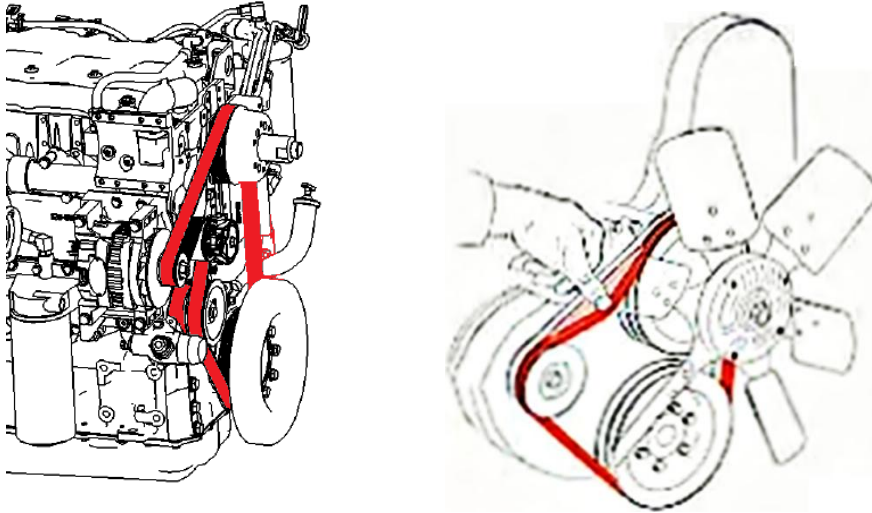
*Figure : Cooler and radiator cleaning*

*Table: Cooler and radiator cleaning*

Check point	Parts	Instruction
-	Cooler, Radiator, Air conditioner heat exchanger	<p>Cleaning with air gun.</p> <p>The cooling fins are very thin and easy to be damaged by pressure. When using air gun, keep a distance unless fins will be damaged.</p> <p>Do not use chemical cleaner on cooler which can cause corrosion on pin and cooler</p>

#### 5.4.4 Engine belt tension check

- Engine belt tension check  
: Maintenance interval (Daily, before operation)



*Figure : Engine belt and tension check*

Note:

The above figures may be different according to engine models.

Table: Engine belt maintenance

Check point	Parts	Instruction
-	Engine belt	<p>Dismantle belt cover, and push belt with finger (about 10kg). Allowable range of deformation is around 10 ~ 15 mm.</p> <p>If tension is too loose, adjust tension according to engine maintenance manual.</p> <p>If belt is likely to break or worn out badly, replace it with new one.</p>

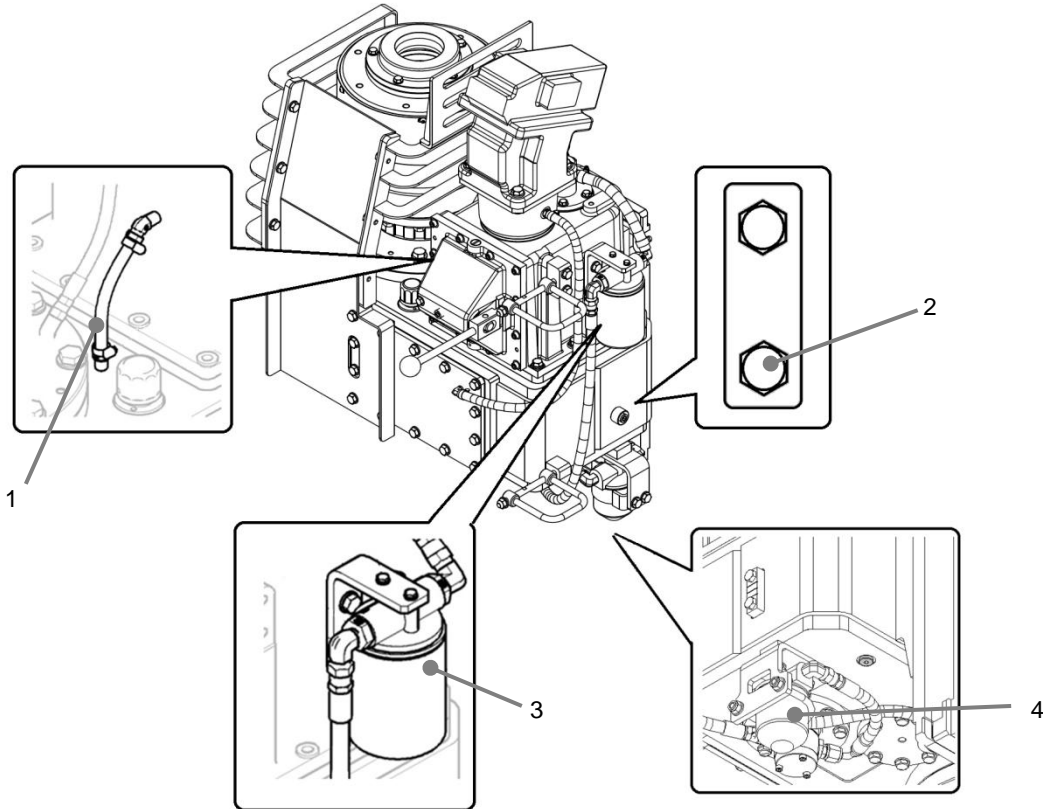


**DANGER!**

Do not run the engine during belt tension check.

### 5.4.5 Rotary head maintenance

- Maintenance intervals  
: Maintenance interval (Daily, before operation)



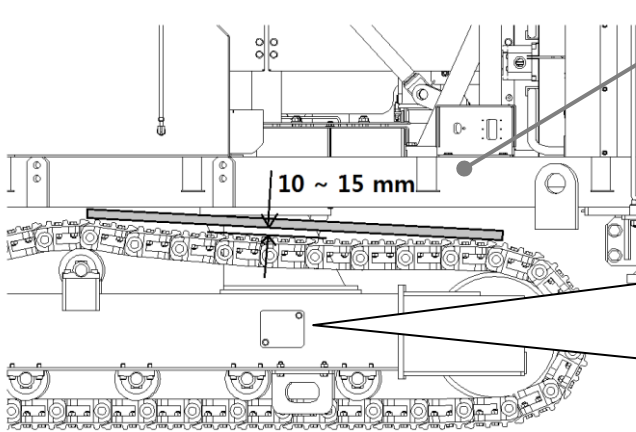
*Figure : Rotary head maintenance*

*Table: Rotary head maintenance*

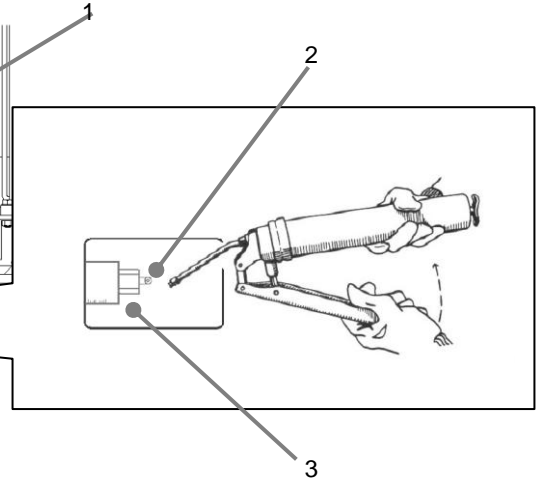
Check point	Parts	Instruction
1	Silicon hose	Check lubrication oil circulation during operation.
2	Lubrication oil level check plug	Dismantle plug and check if oil comes out from the hole.
3	Oil filter	Replace oil filter every 250 hr engine hour operation with lubrication oil
4	Suction filters	Replace suction filter every 250 hr engine hour operation with lubrication oil

### 5.4.6 Track tension check

- Engine belt tension check  
: Maintenance interval (Weekly, before operation)



*Figure : Track tension check*



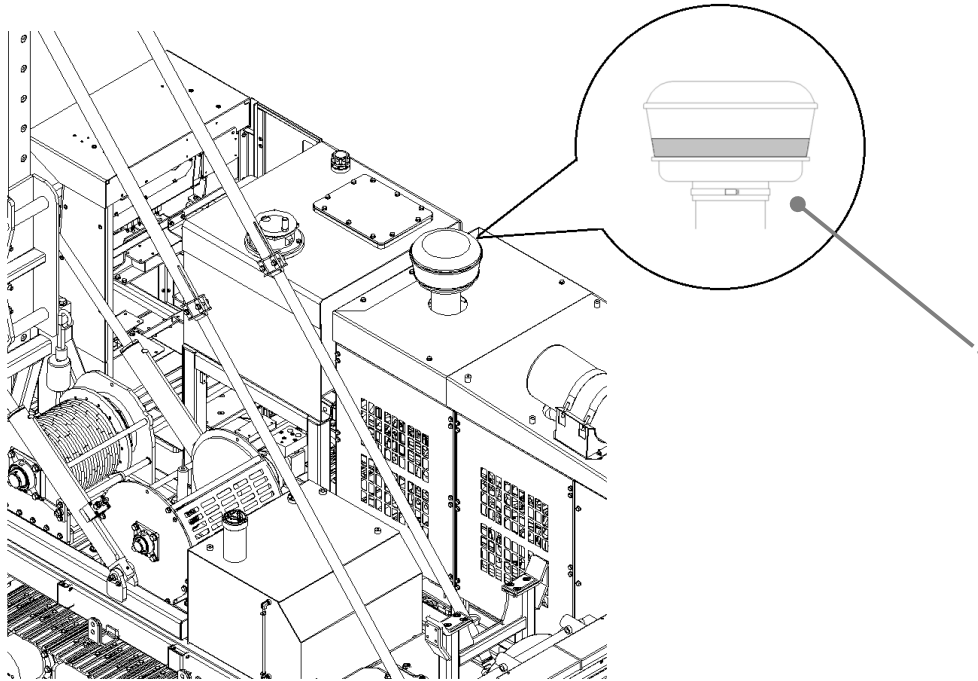
*Figure : Track tension adjustment*

*Table: Track tension check and adjustment*

Check point	Parts	Instruction
1	Track tension check	Put the machine on flat and firm ground.  Put straight plate or bar on the track and check the gap. Proper gap is 10 ~ 15 mm.
2	Grease nipple	If tension is too loose, open cover plate and supply grease on the nipple.
3	Check valve	If tension is too tight, dismantle check valve, and grease will come out.

### 5.4.7 Air filter cleaning

- Pre-cleaner  
: Maintenance interval (Weekly, after operation)



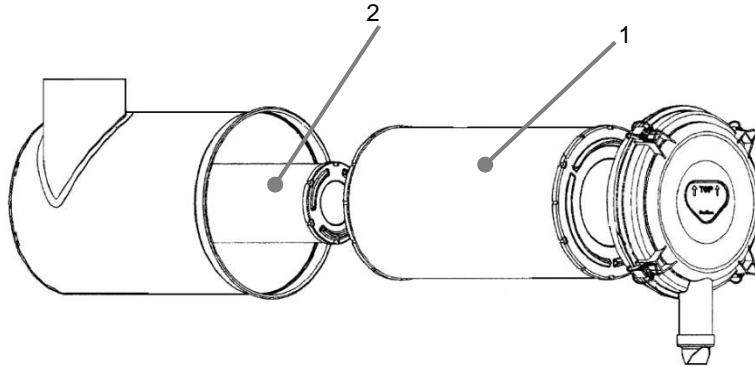
*Figure : Air pre-cleaner*

*Table: Air pre-cleaner maintenance*

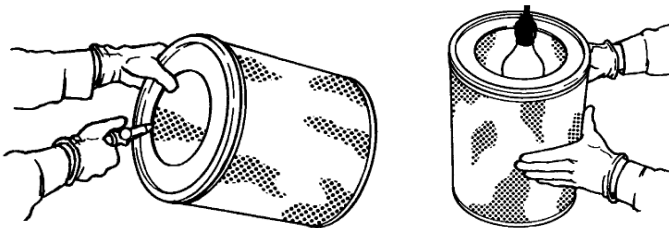
Check point	Parts	Instruction
1	Air pre-cleaner	Remove pre-cleaner and remove dusts.



- Air cleaner filter maintenance  
: Maintenance interval (Weekly, after operation)



*Figure : Air filters*



*Figure : Air filter cleaning and inspection*

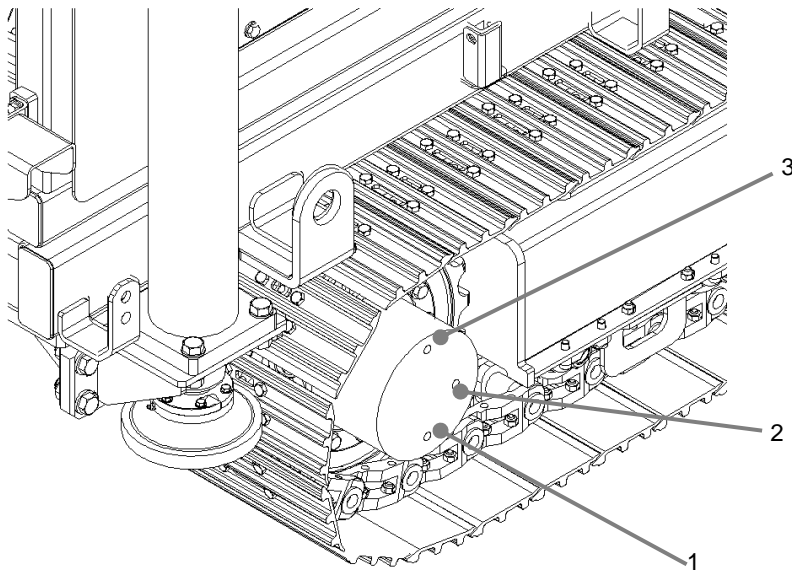
*Table: Air cleaner filters maintenance*

Check point	Parts	Instruction
1	Primary air filter	<p>Open air cleaner cap.</p> <p>Dismantle primary air filter, and clean it with air gun.</p> <p>Inspect, and replace new filter if old one is damaged.</p>
2	Secondary air filter	<p>Dismantle secondary air filter, and clean it with air gun.</p> <p>Inspect, and replace new filter if old one is damaged.</p>

### 5.4.8 Travel motor oil replacement

- Travel motor oil replacement

: Maintenance interval (500 hour after first operation, Every 1000 engine hour)



*Figure : Travel motor oil replacement*

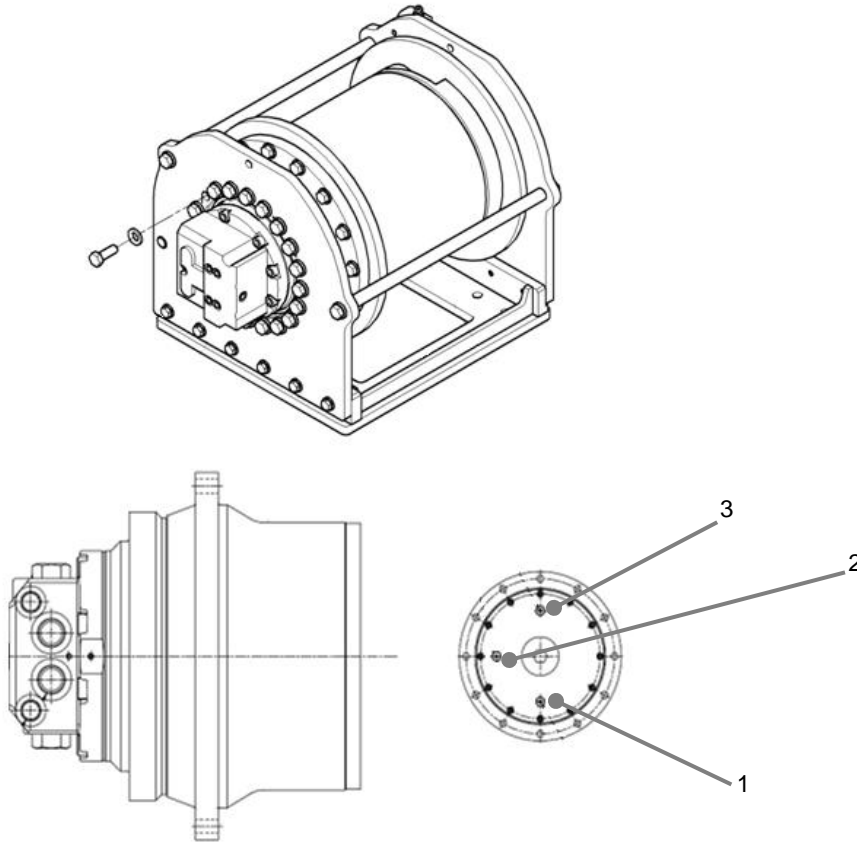
Table: Feed motor oil replacement procedure

Check point	Parts	Instruction
1	Oil drain plug	Dismantle plug for draining oil. After draining oil completely, tighten it.
2	Oil level check plug	Before putting oil, open the plug. When oil come out from the hole, stop oil filling and assemble plug.
3	Oil filling plug	Loose plug for filling oil. After filling oil tighten it.

### 5.4.9 Main winch motor oil replacement

- Main winch motor oil replacement

: Maintenance interval (500 hour after first operation, Every 1000 engine hour)



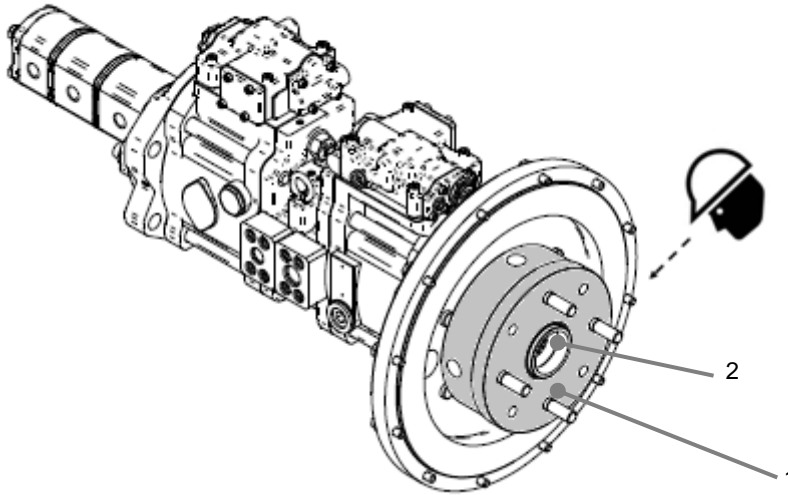
*Figure : Main winch motor oil replacement*

*Table: Main winch motor oil replacement procedure*

Check point	Parts	Instruction
1	Oil drain plug	Dismantle plug for draining oil. After draining oil completely, tighten it.
2	Oil level check plug	Before putting oil, open the plug. When oil come out from the hole, stop oil filling and assemble plug.
3	Oil filling plug	Loose plug for filling oil. After filling oil tighten it.

### 5.4.10 Flexible coupling maintenance

- Flexible coupling maintenance
  - : Inspection (Every 50th engine hour)
  - : Replacement (Every 2000 engine hour)



*Figure : Flexible coupling (Centerflex) and hubs*

Note:

The above figures may be different according to engine models.

Table: Oil separator replacement

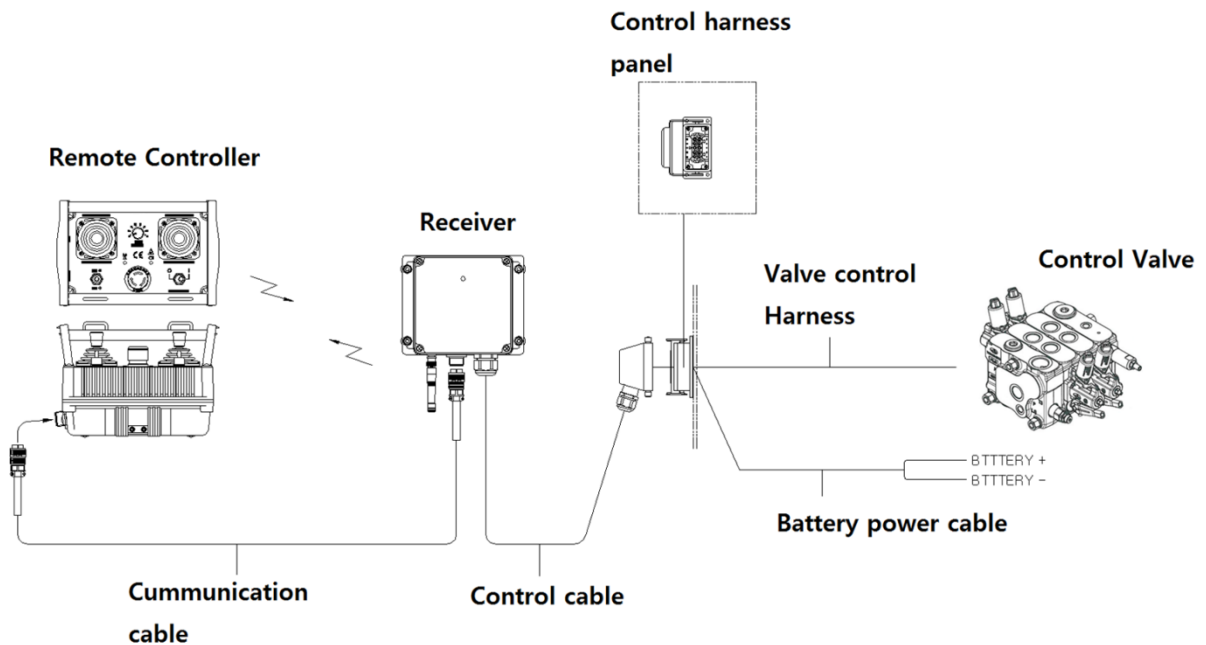
Check point	Parts	Instruction
1	Flexible coupling	Check wear condition by inspection (every 50 engine hour) Replace flexible couplings (every 2000 engine hour)
2	Hub	Check damage and wear (every 50 engine hour) Replace hubs (every 2000 engine hour)

## 6. Options

### 6.1 Remote controller

For safe travel operation, remote control can be equipped and supplied as option.

#### 6.1.1 Components



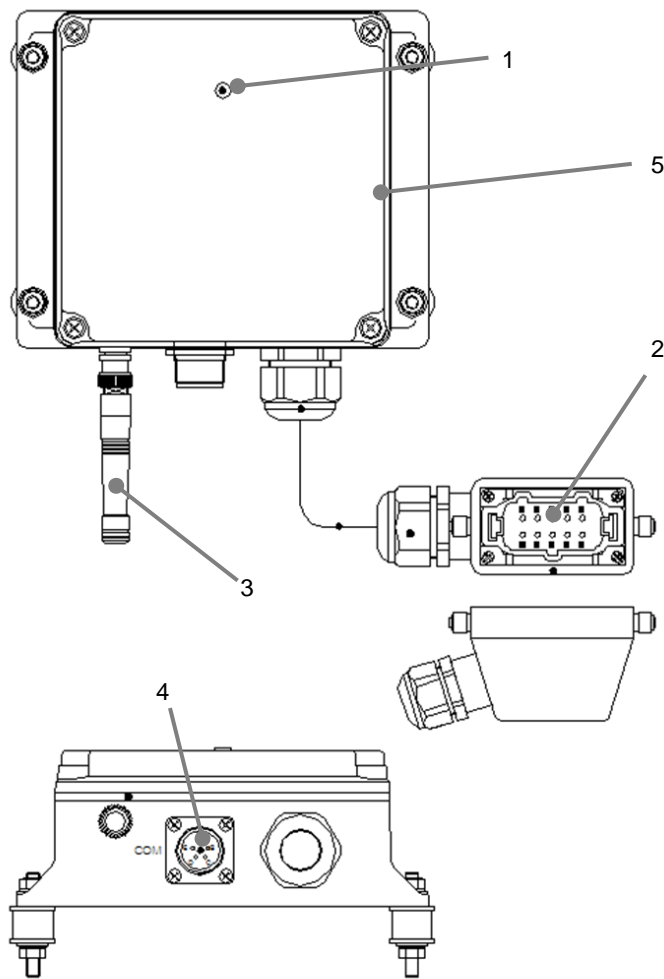
*Figure: Remote controller.*

Remote control send signal to operate travel motors. It provides safe operation for machine traveling. Wireless control and cable control can be available.

When wireless control is out of order, connect communication cable and operate it with cable line until it being repaired.

If cable / wireless operation has malfunction, operate it with manual lever and contact Everdigm official service for repair.

## 6.1.2 Receiver



*Figure: Receiver.*

*Table: Receiver.*

Item	Name	Description
1	Working LED lamp (Green)	It shows the condition of receiver.
2	Control harness connector	It connects control valve and battery for operation.
3	Antenna	It receives the wireless signals from remote controller
4	Control cable connector	It is the input line for cable connection with remote controller.
5	Cable / Wireless control mode selection switch	When receiver connects with remote controller by cable, press the switch to activate the cable connection.

### 6.1.3 Remote controller

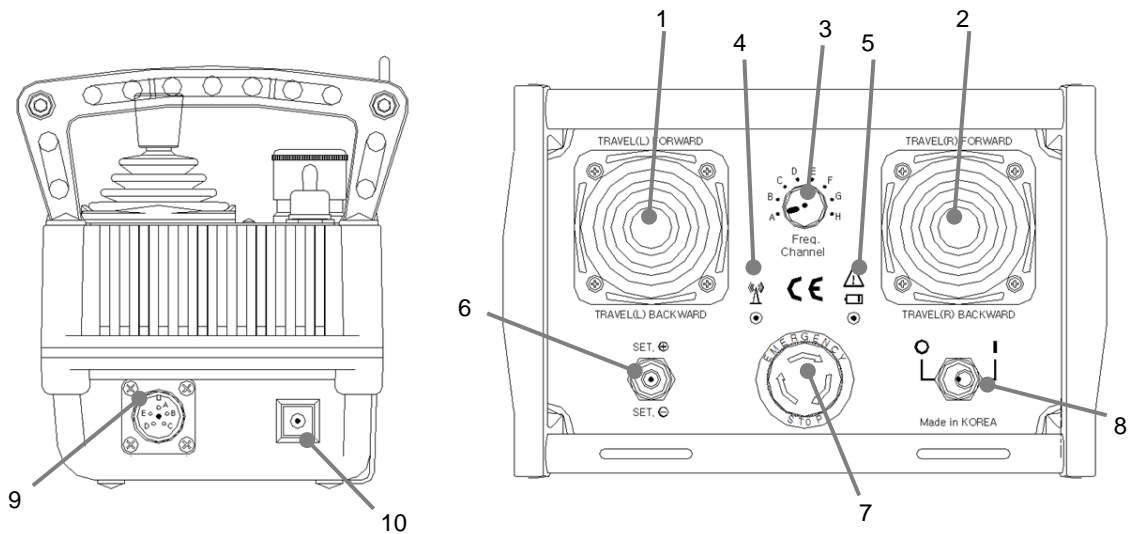


Figure: Remote controller.

Table: Receiver.

Item	Name	Description
1	Joystick (Left travel control)	Left track forward / Backward operation.
2	Joystick (Right travel control)	Right track forward / Backward operation.
3	Frequency channel switch	Changing wireless frequency channel. <a href="#">See 6.1.3.1</a>
4	Working LED lamp (Green)	It shows the condition of wireless connection with receiver.
5	Battery warning lamp (Red)	It blinks every seconds when low battery is detected.
6	Set switch	When it has program mode, set the values with this switch. <a href="#">See 6.1.3.2</a>
7	Emergency stop switch	To stop operation immediately, press emergency switch. To release emergency mode, rotate switch.
8	Power ON/OFF switch	When power is ON and it connects with receiver correctly, the working LED (4) blinks every 4 seconds
9	Control cable connector	It is the output line for cable connection with receiver.
10	Program mode switch	It can set the traveling speed. <a href="#">See 6.1.3.2</a> for more details.

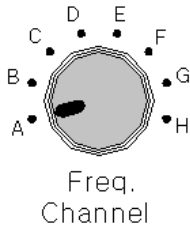
### 6.1.3.1 Wireless frequency channel setting



#### CAUTION!

All the remote controls have their own identification number to prevent interruption during the radio control.

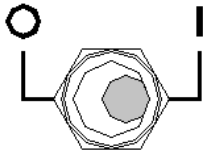
If both identification number of the remote controller and receiver do not correspond to each other, remote control will not work.



*Figure: Frequency channel switch*



*Fig: Working LED lamp & Battery warning lamp*

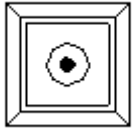


*Figure: Power ON (I) / OFF (O) switch*

The wireless remote controller and the receiver have total eight radio frequency channels. When there is wireless signal interruption by using same frequency channel or other external factors, it should be changed to other channel by setting the frequency channel switch. When you change the channel, make sure the power switch is on. After setting the channel, turn off the power switch and turn on the power switch again. If the working LED lamp and the battery warning lamp blink simultaneously, it indicates that frequency channel is changed.



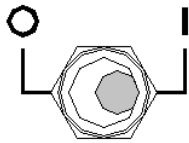
### 6.1.3.2 Program mode setting



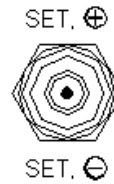
*Figure: Program mode switch*



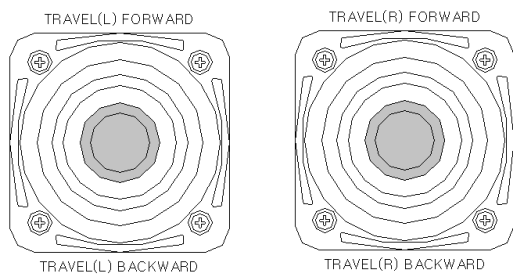
*Fig: Working LED lamp & Battery warning lamp*



*Figure: Power ON (I) / OFF (O) switch*



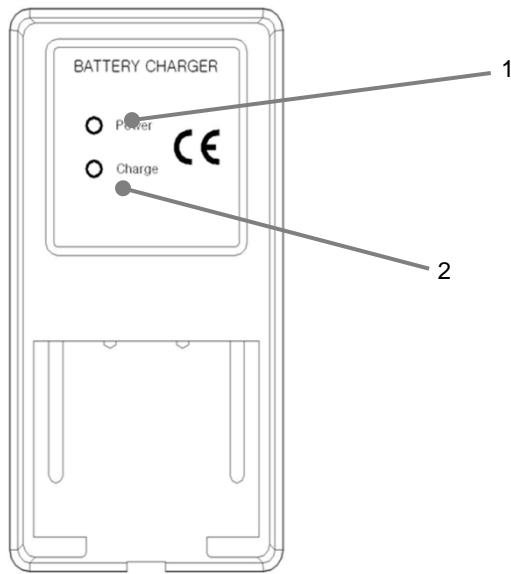
*Fig: Set switch*



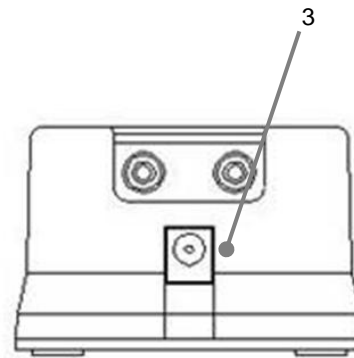
*Figure: Travel control joystick*

- (1) In order to switch to the program mode, turn off power switch and turn on power switch again with the program mode switch being pressed.
- (2) When working LED lamp starts to blink quickly, it indicates that it is changed over to the program mode.
- (3) To set the speed of crawler travel, tilt travel control joystick at about 15 degree angle and set the MIN value with using the set switch, and then tilt travel control joystick at the maximum angle and set the MAX value using the set switch.
- (4) To change over to the action mode, turn off the power switch and turn on the power switch again when all the setup is finished.

### 6.1.3.3 Battery and battery charger of remote controller



*Figure: Battery*



*Fig: Battery charger*

Use genuine battery only. Do not dismantle battery charger.

Charge battery after it is completely empty. Once battery is fully recharged, it can be used about 14~16 hours.

The number of repeat of charging and discharging battery is 600 times. It is not recommended recharging the battery too frequently.

*Table: Battery and battery charger*

Check point	Parts	Instruction	
1	Power LED lamp	It shows the condition of battery Red light : Activated.	
2	Charge LED lamp	Red	Need recharge
		Orange	Charging is progressing
		Green	Charging completed
3	Electric connector	DC connector (12V ~ 24 V)	

## 6.2 Engine coolant preheating system

Engine coolant preheating system is adapted as option to supply heat on engine at a designated time. Webasto coolant heating system provides easy engine start in cold climate area.



### DANGER!

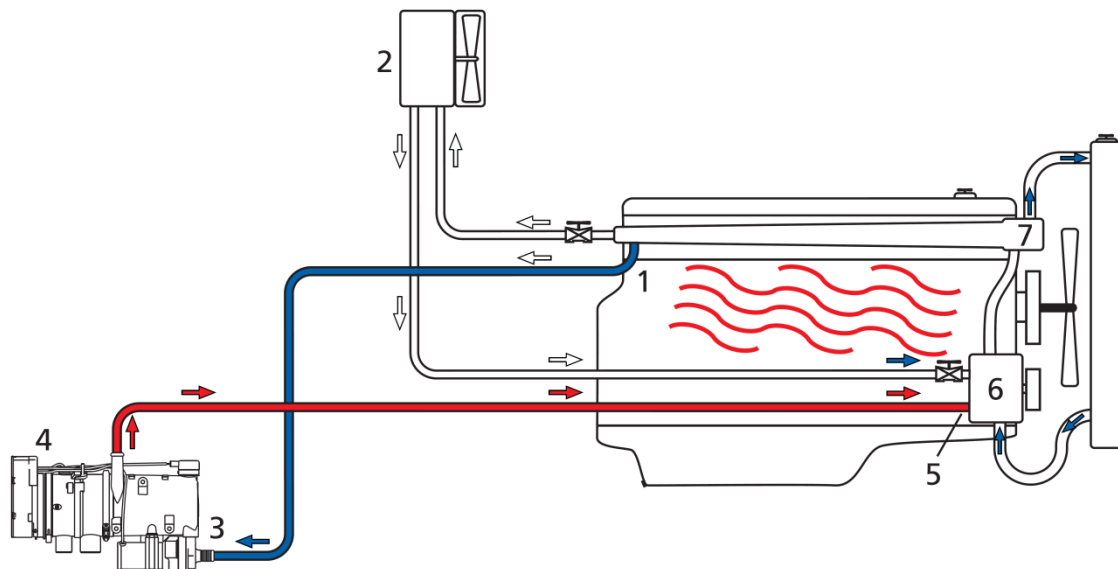
Do not touch coolant preheating system including pipes while it is running. The heater will generate heat, and you may hurt by heat.



### IMPORTANT!

The electricity is constantly consumed by heater. When machine is likely stored more than 1 week, turn off master switch and disconnect battery from machine.

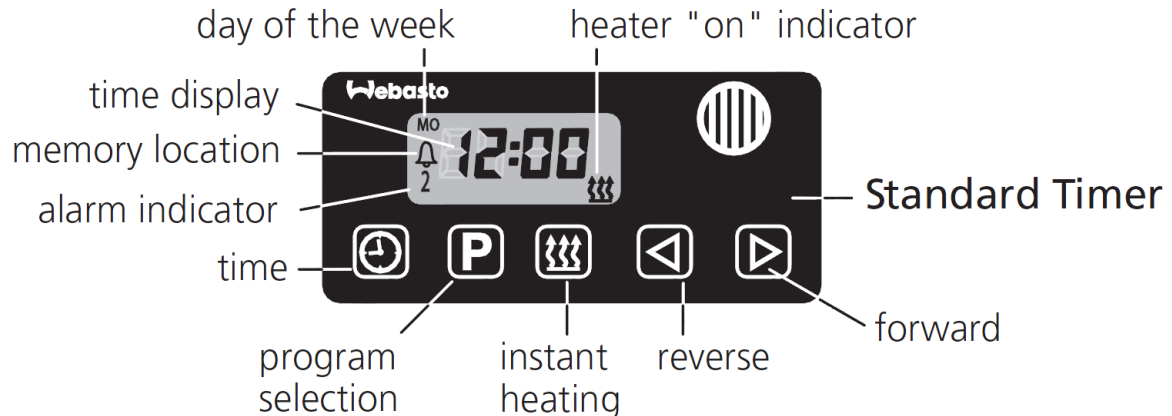
### 6.2.1 System configuration



*Figure : Coolant preheating system*

- 1 : Coolant supply connection
- 2 : Radiator
- 3 : Coolant pump
- 4 : Coolant heater
- 5 : Coolant return connection
- 6 : Engine coolant pump
- 7 : Thermostat

## 6.2.2 Timer setting



### General

The standard digital timer enables you to preset the start of the heater operation up to 7 days in advance. It is possible to program 3 different starting times, only one of which can be activated. The standard digital timer features a wakeup alarm function.

When the ignition is switched on, the timer displays the current time and the day of the week. When the heater is switched on, the display and buttons are illuminated.

After the power supply has been connected, all symbols on the display will flash. The current time and weekday must be set.

### Operation

The timer can be operated in that all flashing symbols can be adjusted by means of the ◀ and ▶ buttons. If the buttons are not pressed within 5 seconds, the time displayed will be stored. If ▶ button is pressed for more than 2 seconds, the fast time setting mode is activated.

If the ignition is switched off while the heater is operating in the continuous mode, the remaining operating time of 15 minutes is displayed and the heater continues to operate for this period of time.

### Switching the heater on

Manually : by pressing the 🔥 button (continuous heating mode).

Automatically : by programming the heater starting time.

### Switching the heater off

Manually : by pressing the 🔥 button (continuous heating mode).


Automatically : after the programmed operating time has elapsed.

With the heater running : by programming the remaining operating time.





### Setting time / day of the week

Press the ⌚ button for more than 2 seconds - time of the day is flashing - and set the clock using the ◀ and ▶ buttons. Day of the week is flashing - adjust the day of the week.



### Viewing the time

With the ignition switched off : press the  button.




### Programming heater starting time

Press the  button - the memory location is flashing - using  and  buttons set start of the heater operating time. Day of the week is flashing - set the day of the week. By repeatedly pressing the  button, memory locations 2 and 3 can be programmed or the timer display mode can be reached.



### Recalling / erasing preset times

Repeatedly press the  button until the desired memory location is displayed. To erase the preset time, press the  button several times until the time of the day is displayed instead of the memory.

### Programming duration of operating time





The heater must be switched off. Press the  button for 3 seconds - operating time is flashing - and set the desired operating time (10 to 120 minutes) using the  and  buttons.

### Setting the remaining operating time

Set the desired remaining operating time (1 to 120 minutes) using the  and  buttons. The remaining operating time refers to the time the heater still continues to remain in operation. It can only be changed while the heater is in operation and the ignition switched off.

### Setting the wake up time

A wake up time can only be programmed on the standard digital timer. The wakeup time is not bound to a specific day of the week.

Repeatedly press the  button until the bell symbol  appears on the display. Set the desired wakeup time using the  and  buttons. The alarm clock turns off after 5 minutes or when one of the buttons is pressed.

### Recalling / erasing the wakeup time

Repeatedly press the  button until the bell symbol  appears on the display - read off wakeup time. To erase the wakeup time : press the  button until the bell symbol  is no longer visible on the display.

### Remote control

Possible by means of an optional external "instant heating" button.

### 6.2.3 Trouble shooting for coolant preheater

In the event of a mal function, fuses and electrical connections should be checked for proper condition and security.

If this action does not correct the failure, consult with your authorized Webasto dealer.

After the heater has been shut down due to a fault lock-out, coded flashing signal is emitted through the operation indicator during the after-run cycle of the heater. These coded flashing signals are designed to assist the authorized Webasto dealer in isolating the fault.

#### Heater turns itself off automatically (=fault lock-out)

Cause	Remedy
Combustion was not established during start-up and start-up repetition.	√ Switch heater off and then on again. √ If the heater fails to re-start, consult with authorized Webasto dealer nearby you.
Frame goes out during operation.	
Voltage drop for more than 20 seconds	√ Check fuses, electrical connections and battery
Heater overheats due to lack/loss of coolant	√ Fill up coolant according to instruction

#### Fault code display

The following error code will be shown in the digital timer display by self diagnostic system.

- F 01 : No start-up (after 2 start-up attempts)
- F02 : Fame extinguished
- F03 : Undervoltage or overvoltage
- F04 : Premature flame detection
- F05 : Fame detector interruption or flame detector short-circuit
- F06 : Temperature sensor interruption or temperature sensor short-circuit
- F07 : Metering pump interruption or metering pump short-circuit
- F08 : Fan motor interruption or fan motor short-circuit or incorrect fan motor speed
- F09 : Pencil-type glow plug interruption or pencil-type glow plug short-circuit
- F10 : Overheating
- F11 : Circulating pump interruption or circulation pump short circuit

## 6.3 Operator cabin

Operator cabin provides clean and safe operation by isolating operating area. Cabin can be supplied as option kit.



### **DANGER!**

Installing cabin on the machine will break weight balance of machine. Do not travel the machine when cabin is installed on.

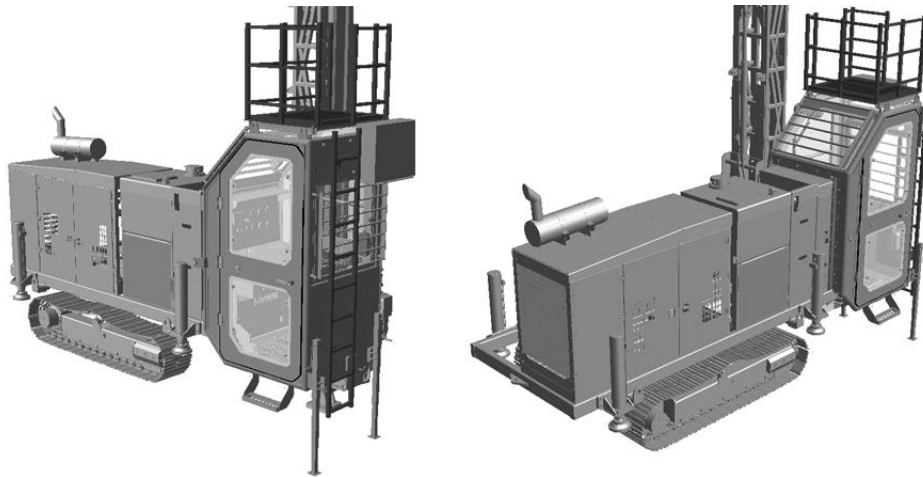
Before installing cabin, extend outriggers for supporting machine correctly.



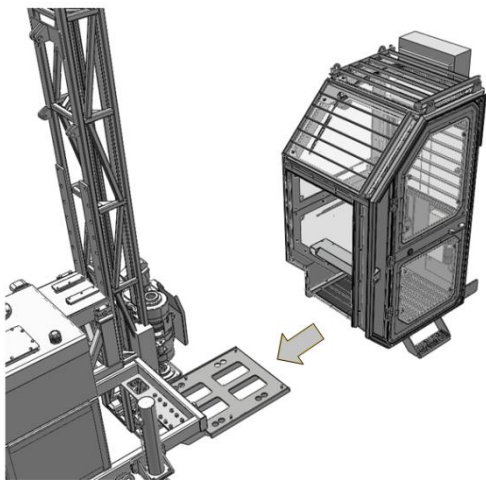
### **WARNING!**

Cabin can not completely isolate the operator with atmosphere air, and toxic air and dust may come inside of cabin.

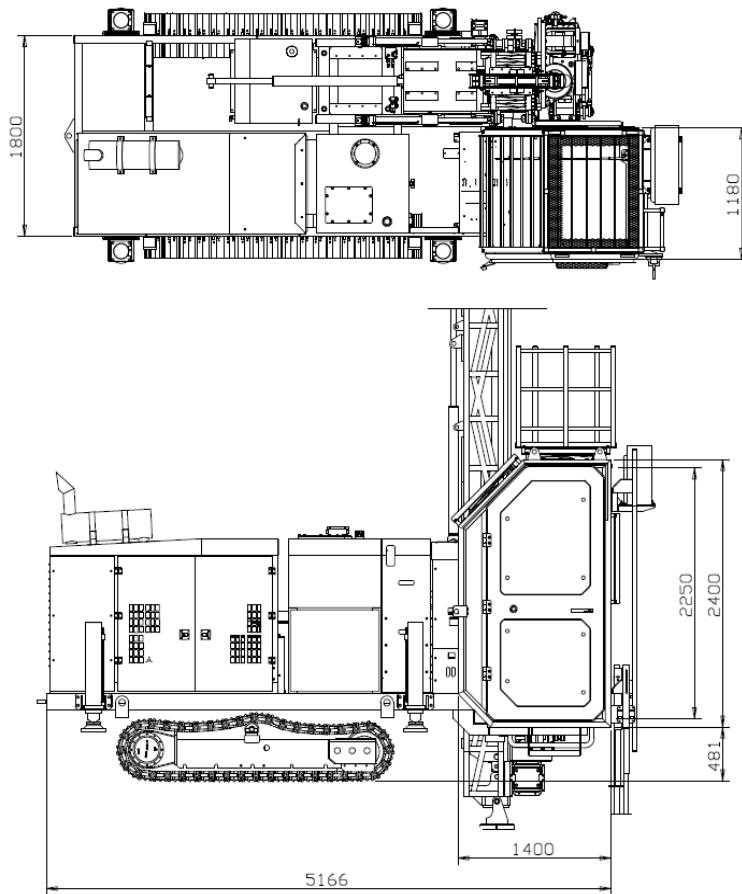
### 6.2.1 External figure and dimensions



*Figure : External figure after installation*



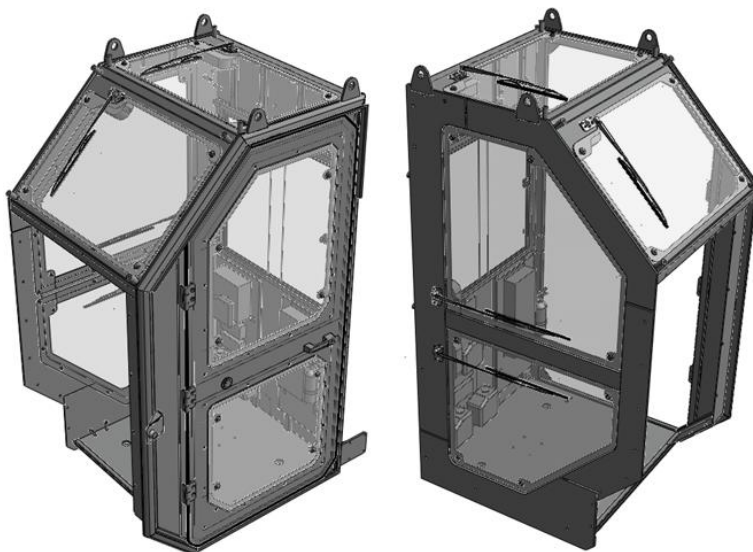
*Figure : Cabin installation*



*Figure : Dimensions*

## 6.2.2 Features and benefit

### Window and wipers



Two Large Tempered Glasses (5mm) and Wiper at Top

Two Large Tempered Glasses and Wiper at Rotary Head Side

Two Large Tempered Glasses at Door

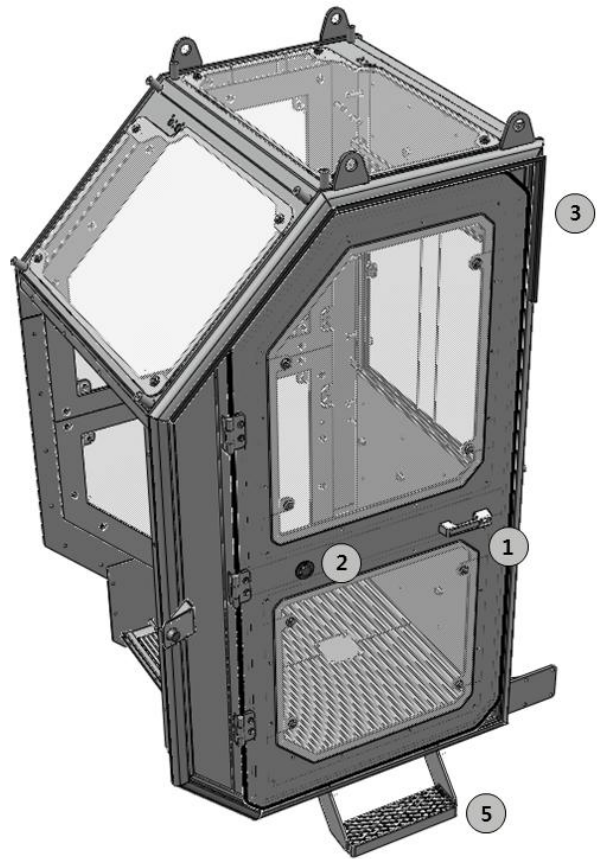
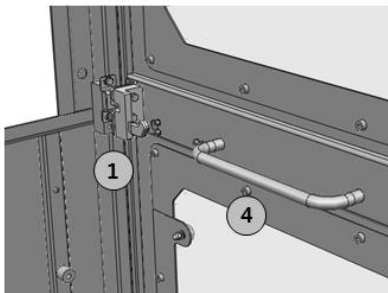
One Sliding Chassis (with Tempered Glassed) at Rear

*Figure : Window and wipers*



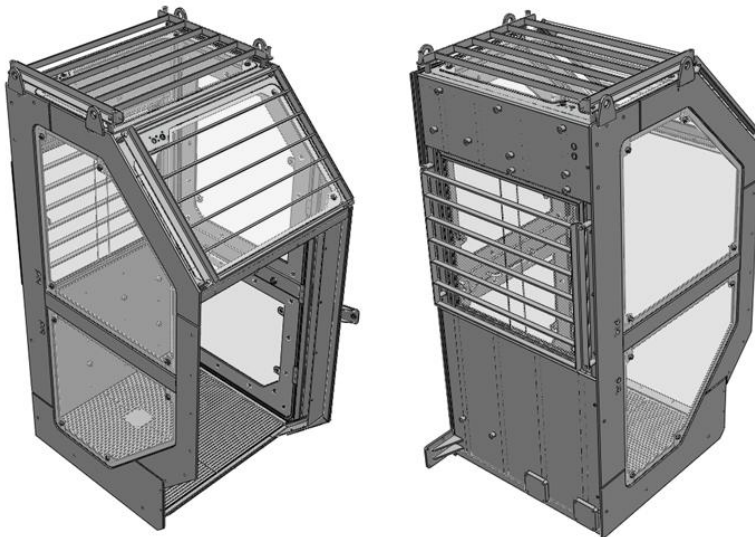
## Window and wipers

- ① Strong and Durable Door Handle and Catch
- ② Wide Door Opening (170°) and Door Lock-Release Catch
- ③ Rain eaves to prevent leakage
- ④ Door Grab Bar
- ⑤ Step plate for easy Access



*Figure : Window and wipers*

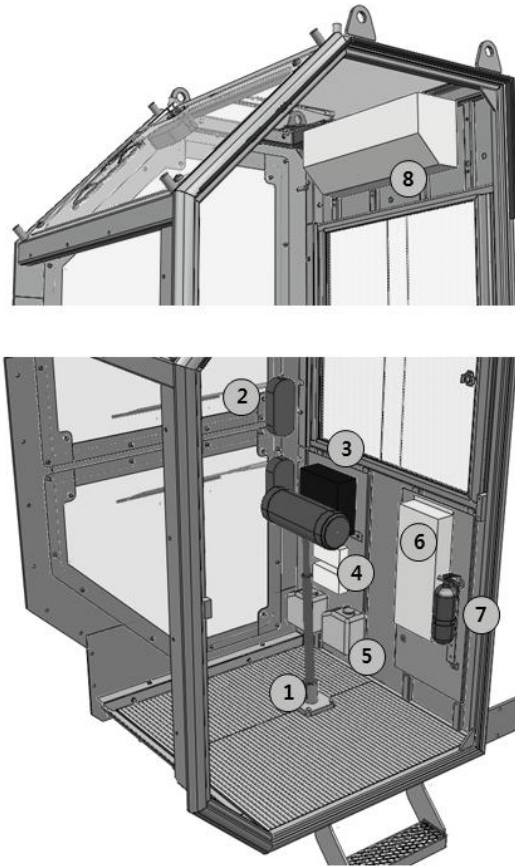
## Protection guard



Strong and Rugged Guard to guard glasses from damage

*Figure : Protection guard*

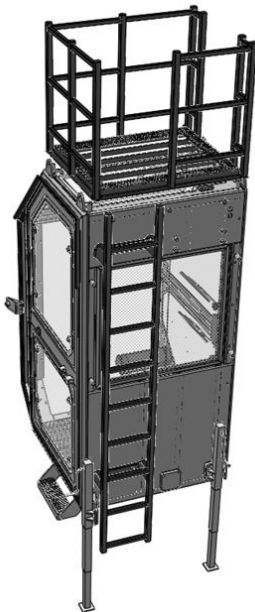
## Interior



- ① Standing Seat (Adjustable)
- ② Wiper Motor 4ea
- ③ Wiper Motor Control Box
- ④ Inverter (DC24 to DC12)
- ⑤ Wiper Washer Bottle
- ⑥ Inverter (DC to AC)
- ⑦ Extinguisher
- ⑧ Air conditioner ⑧

*Figure : Interior*

## Ladder



Ladder and Guardrail Structure to  
maintenance the mast, rotary head  
at High position

Support Jack to hold the cabin strong

*Figure : Ladder*

## 7. Torque table

Bolt		Strength Spec	8.8		10.9		12.9	
Normal	Fine		N.m	kgf.m	N.m	kgf.m	N.m	kgf.m
•		<b>M4 x 0.7</b>	<b>2.8</b>	<b>0.3</b>	<b>4.1</b>	<b>0.4</b>	<b>4.8</b>	<b>0.5</b>
•		<b>M5 x 0.8</b>	<b>5.5</b>	<b>0.6</b>	<b>8.1</b>	<b>0.8</b>	<b>9.5</b>	<b>1.0</b>
•		<b>M6 x 1.0</b>	<b>9.5</b>	<b>1.0</b>	<b>14</b>	<b>1.4</b>	<b>16.5</b>	<b>1.7</b>
	•	M8 x 1.0	24.5	2.5	36	3.7	43	4.4
•		<b>M8 x 1.25</b>	<b>23</b>	<b>2.3</b>	<b>34</b>	<b>3.5</b>	<b>40</b>	<b>4.1</b>
	○	M10 x 1.0	52	5.3	76	7.8	89	9.1
	•	M10 x 1.25	49	5.0	72	7.3	84	8.6
•		<b>M10 x 1.5</b>	<b>46</b>	<b>4.7</b>	<b>68</b>	<b>6.9</b>	<b>79</b>	<b>8.1</b>
	•	M12 x 1.25	87	8.9	125	12.5	150	15
	○	M12 x 1.5	83	8.5	122	12.5	145	15
•		<b>M12 x 1.75</b>	<b>79</b>	<b>8.1</b>	<b>117</b>	<b>12</b>	<b>135</b>	<b>14</b>
	•	M14 x 1.5	135	14	200	20	235	24
•		<b>M14 x 2.0</b>	<b>125</b>	<b>13</b>	<b>185</b>	<b>19</b>	<b>215</b>	<b>22</b>
	•	M16 x 1.5	205	21	300	30	360	37
•		<b>M16 x 2.0</b>	<b>195</b>	<b>20</b>	<b>280</b>	<b>28</b>	<b>330</b>	<b>34</b>
	•	M18 x 1.5	310	32	440	45	520	53
	○	M18 x 2.0	290	30	420	43	490	50
•		<b>M18 x 2.5</b>	<b>280</b>	<b>29</b>	<b>390</b>	<b>40</b>	<b>460</b>	<b>47</b>
	•	M20 x 1.5	430	44	620	63	720	73
•		<b>M20 x 2.5</b>	<b>390</b>	<b>40</b>	<b>560</b>	<b>57</b>	<b>650</b>	<b>66</b>
	•	M22 x 1.5	580	59	820	83	960	98
•		<b>M22 x 2.5</b>	<b>530</b>	<b>54</b>	<b>750</b>	<b>76</b>	<b>880</b>	<b>90</b>
	○	M24 x 1.5	760	77	1,090	110	1,270	130
	•	M24 x 2.0	730	74	1,040	105	1,220	125
•		<b>M24 x 3.0</b>	<b>670</b>	<b>68</b>	<b>960</b>	<b>98</b>	<b>1,120</b>	<b>115</b>
	○	M27 x 1.5	1,110	115	1,580	160	1,850	190
	•	M27 x 2.0	1,070	110	1,500	150	1,800	185
•		<b>M27 x 3.0</b>	<b>1,000</b>	<b>100</b>	<b>1,400</b>	<b>140</b>	<b>1,650</b>	<b>170</b>
	○	M30 x 1.5	1,540	155	2,190	225	2,560	260
	•	M30 x 2.0	1,490	150	2,120	215	2,480	255
•		<b>M30 x 3.5</b>	<b>1,350</b>	<b>140</b>	<b>1,900</b>	<b>195</b>	<b>2,250</b>	<b>230</b>
	○	M33 x 1.5	2,050	210	2,920	300	3,420	350
	•	M33 x 2.0	2,000	205	2,800	285	3,300	335
•		<b>M33 x 3.5</b>	<b>1,850</b>	<b>190</b>	<b>2,600</b>	<b>265</b>	<b>3,000</b>	<b>305</b>
	○	M36 x 1.5	2,680	275	3,820	390	4,470	455
	•	M36 x 3.0	2,500	255	3,500	355	4,100	420
•		<b>M36 x 4.0</b>	<b>2,350</b>	<b>240</b>	<b>3,300</b>	<b>335</b>	<b>3,900</b>	<b>400</b>
	○	M39 x 1.5	3,430	350	4,890	500	5,720	585
	•	M39 x 3.0	3,200	325	4,600	470	5,300	540
•		<b>M39 x 4.0</b>	<b>3,000</b>	<b>305</b>	<b>4,300</b>	<b>440</b>	<b>5,100</b>	<b>520</b>

## 8. Trouble shooting

### 8.1. Engine

Cause	Main cause	Remedy
Engine coolant temperature is too high.	Lack of coolant	√ Refill or replace coolant
	Blocked radiator fins	√ Clean radiator
	Leak from reservoir tank cap	√ Tighten cap
	Blockage of coolant line	√ Check the inner side of radiator and clean it √ Check coolant piping and clean it
	Malfunction of sensor or temperature gauge	√ Repair or replace
	Lack of fan motor efficiency, or failure	√ Check blow condition from fan and hydraulic motor
Engine can not be started. (Engine is not cranked)	Emergency stop system is activated.	√ Check and disable emergency condition
	Master switch is off	√ Turn on master switch
	Disconnected electric line	√ Check electric connections
	Empty batteries	√ Check and recharge batteries
	Ignition switch failure	√ Repair or replace
Engine can not be started. (Engine is cranked)	Lack of fuel	√ Refill fuel
	Mixed air into fuel	√ Exhaust air on fuel line
	Fuel injection pump or nozzle failure	√ Contact official engine service dealer. Change failed parts
	Blockage of fuel line or filters	√ Replace fuel filters and cleaning fuel line
	Fuel leakage from piping and hoses	√ Check and repair the fuel line
Battery charging lamp is "ON"	Lack of alternator efficiency	√ Check the tension of alternator
	Alternator failure	√ Check and change alternator
Sudden engine stop during operation	Lack of engine oil	√ Check the pressure of engine oil and refill it
	High coolant temperature	√ Check radiator and coolant condition
	High compressor oil temperature	√ Check compressor oil condition √ Check oil fan condition

Cause	Main cause	Remedy
<b>Engine RPM can not be adjusted</b>	<b>Cable connection failure (Cummins Engine)</b>	√ Check cable (wire) connection between rpm adjuster and engine
<b>Abnormal exhaust gas from muffler</b>	<b>Dark color</b>	√ Turbo charger is polluted. Clean turbo charger. √ Air filter is blocked. Clean or replace air filters.
	<b>White color</b>	√ Engine oil can be burned. Check remained engine oil level, and repair piston rings. √ Air may be mixed with fuel. Check and exhaust air in fuel.

## 8.2. Traveling

Cause	Main cause	Remedy
<b>Machine won't travel. Traveling is difficult.</b>	<b>Excessive track tension</b>	√ Adjust tension
	<b>Pilot line blockage</b>	√ Check pilot line pressure. Clean pilot line and replace filter
	<b>Failed track motor</b>	√ Repair or replace
	<b>Control lever or valve failure</b>	√ Repair or replace
	<b>Insufficient hydraulic pressure from relief valve</b>	√ Adjust hydraulic pressure
	<b>Main pump failure</b>	√ Repair or replace
<b>Machine slips on a slop with parking position</b>	<b>Break valve failure</b>	√ Check spool and valve
	<b>Too much load on the machine</b>	√ Remove heavy object on the machine
<b>Track shoe gets out of it's place</b>	<b>Loosen track tension</b>	√ Adjust tension
	<b>Worn out idler, roller, or sprocket</b>	√ Replace parts
	<b>Worn out or broken track shoe</b>	√ Replace track shoe assembly

### 8.3. Rotary head

Cause	Main cause	Remedy
Too much heat is generated from transmission	Too much gear oil in transmission	√ Check and adjust oil level
	No oil circulation	√ Check oil circulation condition through silicon hose. Change oil pump.
	Blockage of filters	√ Check and change oil and suction filters.
Abnormal sound from transmission	Internal gear damage	√ Check gear condition
	Wear of bush and bearing	√ Change bush and bearing
	Abnormal contact of components	√ Check if a components interrupt of other components during rotation.
Chuck does not hold pipe	Wrong sized jaw	√ Check pipe size and jaw size if they are matched correctly.
	Worn out jaw tip	√ Check jaw tip wear condition and change jaws.
	Chuck hold lever	√ Check if chuck hold / opening condition and operate lever
Rotary head rotation speed is too slow	Transmission shift lever	√ Check if gear shift lever is set correctly
	Low rotation speed setting	√ Adjust Rotary head rotation speed control knob
	Low engine RPM	√ Adjust engine RPM

## 8.4. Oil cooler

Cause	Main cause	Remedy
Hydraulic oil temperature is too hot	<b>Blocked oil cooler by dust</b>	√ Clean oil cooler
	<b>Low cooling motor efficiency</b>	√ Check hydraulic condition to motor √ Repair or replace motor
	<b>Low hydraulic oil level</b>	√ Fill hydraulic oil in tank
	<b>Temperature gauge or sensor failure</b>	√ Repair or replace

## 8.5. Hydraulic cylinders

Cause	Main cause	Remedy
Hydraulic cylinder is not operated or moves slow	<b>Damaged seals</b>	√ Replace internal seals
	<b>Hydraulic setting problem</b>	√ Check hydraulic pressure and flow, and adjust
	<b>Control lever or valve failure</b>	√ Repair or replace
	<b>Electric solenoid valve failure</b>	√ Check electric signals √ Replace solenoid valve

## Notes

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